MODERN Machine Shop

MORE THAN EVER! Today's demand for quality end mills has developed into an unprecedented volume at Putnam—the end mill specialists. And, because Putnam's first consideration is quality, inspection facilities have greatly increased. If you want end mills with proven performance, call on Putnam.

PUTNAM

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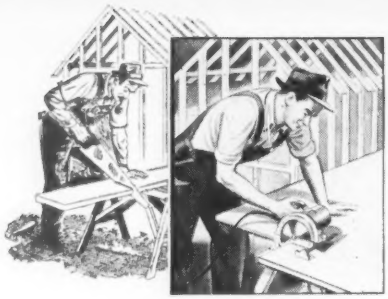


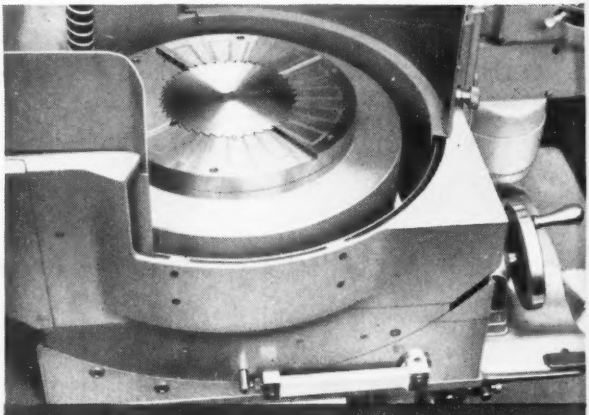
MORE WORK with LESS EFFORT

. . . that's today's trend in production, too— thanks to the time-saving, effort-saving features of Heald grinders and Bore-Matics

Today's high-speed production machines have multiplied manpower many fold. Yet, in so doing, they have made the job many times *easier*, too.

On Heald precision grinders and Bore-Matics, for example, fully automatic cycles, convenient control grouping and simplified loading enable an operator to turn out more parts per hour — with greater accuracy and precision, with less effort and fatigue. And Heald's improved guarding provides extra cleanliness and safety for every operation.

Remember — when it comes to precision finishing, it pays to come to Heald.



Circular Saw Blades Ground

190% FASTER on a new Heald Model 261 Rotary Surface Grinder

In this case HERE'S WHY

1. **AUTOMATIC FEED AND RETRACTION** — the surface grinding operation is performed automatically, with maximum speed and precision, simply by pushing the starting button.

2. **PRECISE TAPER CONTROL** — the chuck is swiveled to provide a .005" taper toward the center of the blade.

3. **SIMPLIFIED LOADING**—the saw blade is simply placed over a center locating plug in the 12" magnetic gap chuck, with a drive pin

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VOLUME 24 NUMBER 2
JULY, 1951

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MODERN Machine Shop

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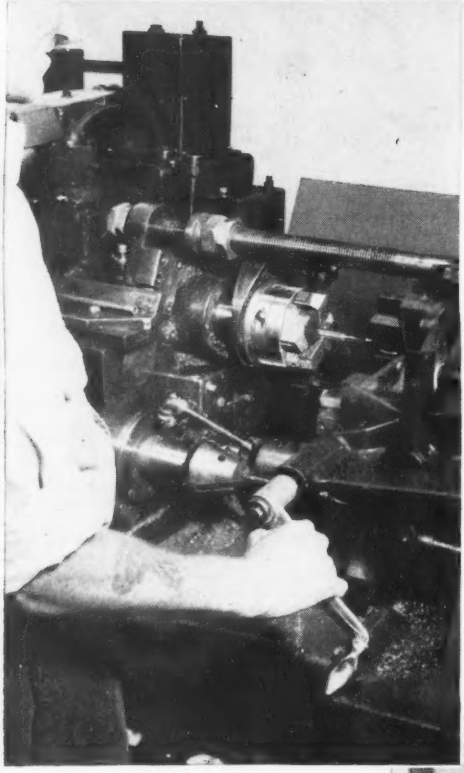
Thread Cost—2/10¢ Per Piece



LANDEX HEAD THREADS 300 PIECES PER HOUR AT LOW TOOL COST!!!

These operations illustrate a case history of the economy and efficiency of the LANDEX Head, designed for cutting precision threads at high production rates on automatic screw machines and other "live" spindle equipment.

In this instance, ½" American Standard Pipe Threads are being generated on sprinkler frames cast of red brass. The threads are cut into a relief 3/32" wide.

The wisdom of the tool engineer in selecting LANDEX Heads for performing these threading operations is borne out by information secured from the cost sheets. Production consistently averages 300 pieces per hour, floor-to-floor time, at a total threading cost of two-tenths of a cent per piece. Tool cost was held to a minimum with 5,000 pieces being threaded between chaser grinds.

This is just one example of many successful applications of the LANDEX Head to jobs requiring high-speed thread production at an economical cost. For additional information, write for Bulletin F-90.

LANDIS *Machine* COMPANY

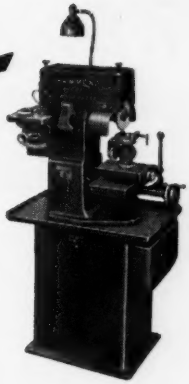
WAYNESBORO • PENNSYLVANIA

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

Hammond

OF KALAMAZOO

CARBIDE TOOL AND CHIP BREAKER GRINDERS

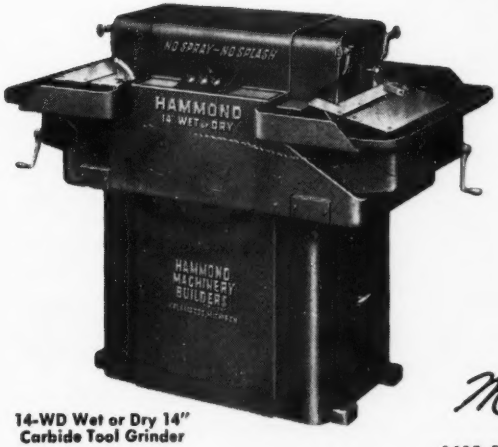


CB-77 Chip Breaker and Diamond Finishing Grinder

Save

TIME
TOOLS
WHEELS

WD-10 Wet or Dry 10" Carbide Tool Grinder



14-WD Wet or Dry 14" Carbide Tool Grinder

Hammond Carbide Tool Grinders will soon pay for themselves thru greater wheel economy, longer tool life and FASTER grinding. They relieve toolroom bottlenecks and step up production. **Write for Carbide Grinder Catalog**

Hammond Machinery Builders INC

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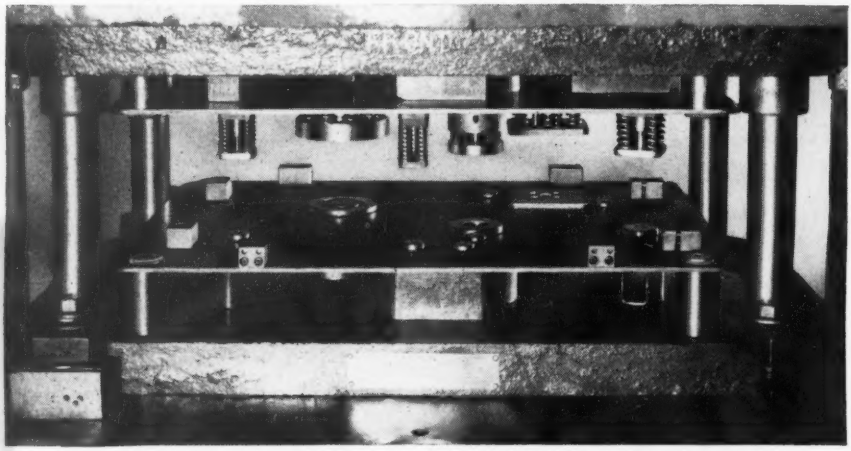
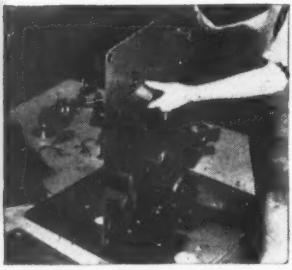
Magnetic PERFORATING · DIES



Magnetic Perforating Die set-up in small inclinable punch press.

NEW and FAST METHOD for Perforating Sheet Metal



Die retainers complete with bushings being inserted in die template.

Write for Catalog . . .

Whistler Magnetic Perforating Punches and Dies have *proven* their cost-cutting advantages in many prominent plants. The catalog shows how. Send for it today.

SAVE PRESS DOWN TIME. Approximately 15 minutes required to change from punching one subject of say 20 holes to a different 20 hole arrangement. Whistler Magnetic Perforating Dies *increase* press production.

HOLD CLOSE TOLERANCES. Hole centers may be held to .0005″ accuracy or as close as can be jig bored.

GREATER PUNCH AND DIE LIFE. Concentricity of punch and die assured thus giving uniform clearance around punch, increasing punch and die life.

SAVE FLOOR SPACE. Die storage cut to a minimum because only the 2 locating templets are stored . . . all that is required to duplicate the set-up.

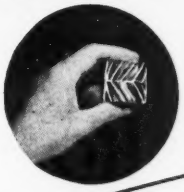
REDUCE DIE COSTS. Whistler Magnetic Perforating Punch and Die units are used repeatedly for different hole arrangements. When completing one job, remove all units from templet and put them into service on the next different set-up. Combine any number of hole sizes and shapes. Punch and die costs are amortized over continued re-use in many jobs.

S. B. WHISTLER & SONS, Inc.

740 Military Road, Buffalo 17, N. Y.

Also manufacturers of a complete line of drawing, forming, blanking and progressive dies to special requirements.

PRECISION COMES IN ANY SIZE FARREL® GEAR



from ¼ inch to 20 feet in diameter

Farrel herringbone gears are made in a complete range of sizes from ¼ inch to 20 feet diameter, ¼ to 60 inch face, 24 DP to 0.75 DP, for any power capacity and any application. The quiet, vibration-free performance and long life you can expect from these gears result from extreme accuracy of tooth spacing, contour and helix angle . . . qualities inherent in the Farrel-Sykes method of gear generation. Farrel engineers will be glad to assist you in working out unusual gear problems. Information about Farrel precision gears will be sent on request.

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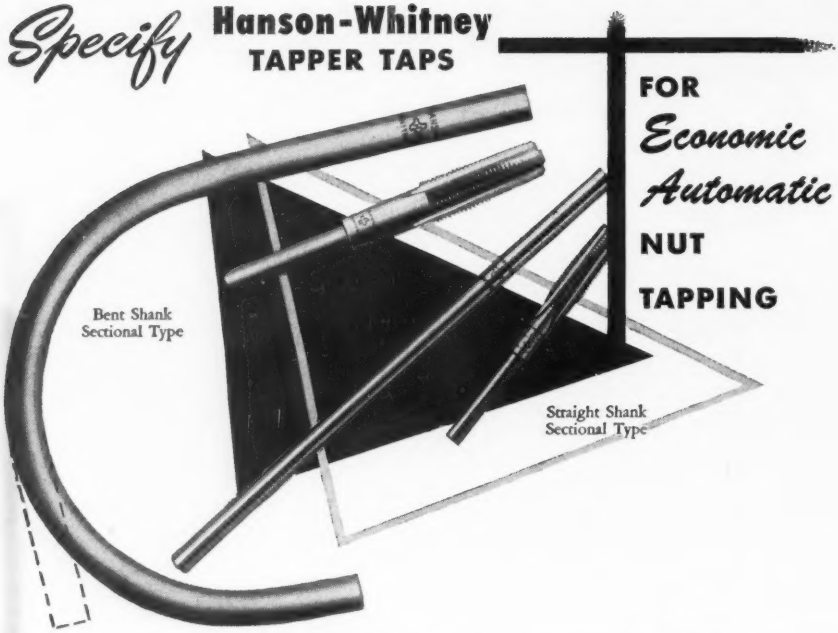
FB-682

Specify **Hanson-Whitney TAPPER TAPS**

FOR *Economic Automatic* **NUT TAPPING**



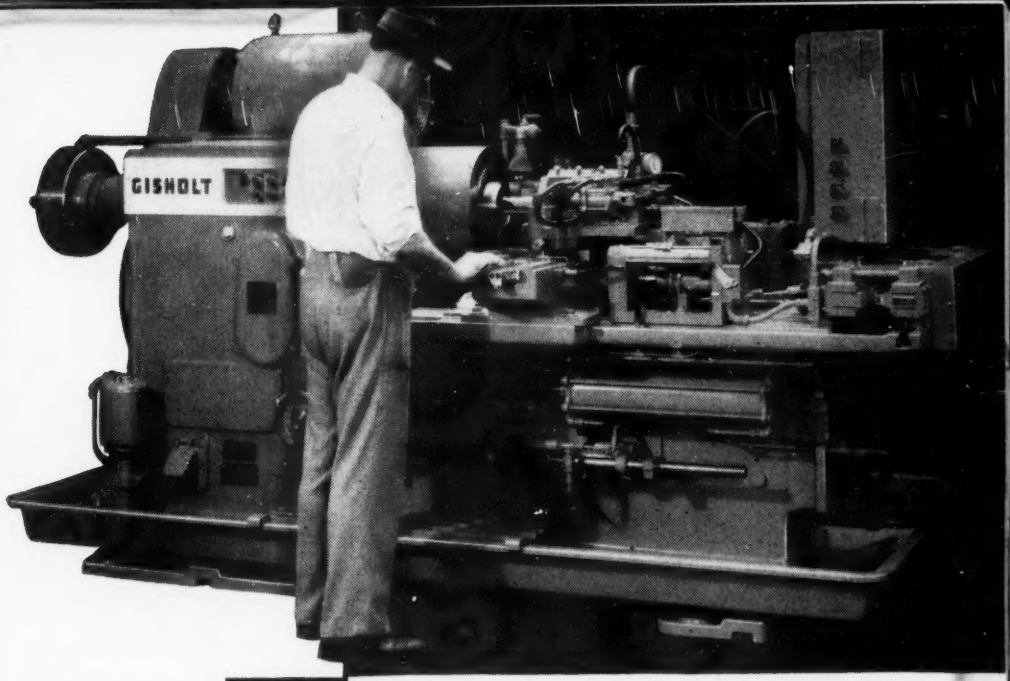
While one piece Tapper Taps . . . both straight and bent shanks . . . are available in standard and special sizes, we recommend the sectional type shown. Used with automatic tapping machines, they are most economical, as the nibs, soldered into shank, can be readily replaced when worn beyond further use. Shanks seldom require replacement.

Sectional type tapper taps are furnished in standard NC and NF series from 1/4" to 3/4" diameter. Intermediate sizes and other thread forms are special. As there are several types of automatic tappers, the name and size of your machine must be given. Shank designs furnished as follows: BENT SHANK — hook or right angle design as illustrated. STRAIGHT SHANK — round, square, Acme Improved Type "C," or National Interchangeable Ring Lock.

Hanson-Whitney taps are finished after hardening on machines of our own design for Quality Control. For more tapped holes per grind and lower cost per piece, specify the H-W line.

HANSON-WHITNEY COMPANY • HARTFORD 2, CONN. • DIVISION OF THE WHITNEY CHAIN COMPANY

Hanson Whitney
PIONEERS OF FINISHED TAPS



HOW 8 SIMPLIMATICS

cut machine time 50%
cut man hours 75%

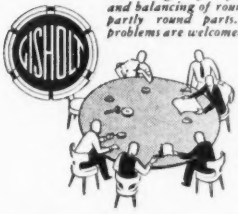
The way you can slash costs with the Gisholt Simplimatic often surprises some of the most experienced production men.

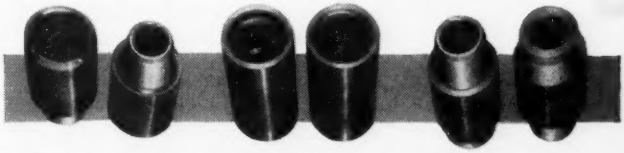
Here's a big shop which found that 8 Simplimatics could take over the job done on 16 other machines. And it takes only 4 operators instead of 16 to turn out the volume of parts required.

Not the least in the cost picture is the machine itself. For the basic Simplimatic design permits you to individualize the machine to a high degree to solve many different problems. Thus, for many jobs you can have all the advantages of a special machine merely with special tooling. Yet it's all done on a Standard Simplimatic—at far lower cost.

The importance of lower costs these days makes it important for you to get all the facts about Simplimatic Automatic Lathes.

The GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*





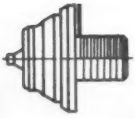
In producing these tool joint pins and boxes, the 8 Simplimatics work in pairs with fully automatic operation one man can easily tend two machines.

Ask about the many different arrangements possible on the Standard Simplimatics with platen table, vertical head, etc.

GISHOLT MACHINE COMPANY, *Madison 10, Wisconsin*

TURRET LATHES • AUTOMATIC LATHES • BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

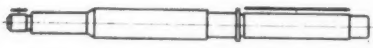
ideas for



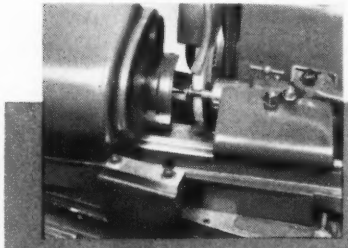
A short, short part . . . grinding the back face and shoulder of nozzles, 83 per hour, with the aid of a special holding device. This 4" Plain Hydraulic Grinder handles other operations, too.

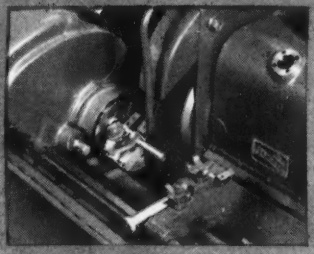
Crankshafts with .050" throw ground from the solid. Cincinnati Application Engineers tooled up a 4" Plain Hydraulic for this job with a work holding fixture featuring repetitive stopping for convenience in loading.

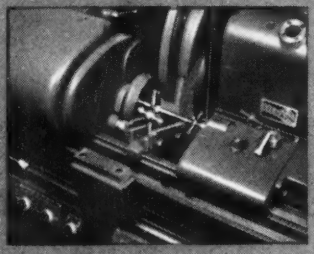
Micrometer barrels, 200 per hour, grinding diameter and bevel simultaneously. This 4" Plain Hydraulic is equipped with work cradles, hydraulic footstock, automatic infeed, and a special table type profile wheel truing attachment.

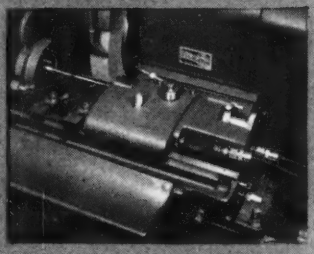


Armature shafts, grinding two diameters in two setups, 200 per hour per diameter. Labor-aiding equipment for the 4" Plain Hydraulic illustrated here consists of automatic infeed, hydraulic footstock, and work cradles.









production

OF SMALL PRECISION GROUND PARTS

In general, the cost of machining operations on small parts should be as small as the part. Four examples of how this goal is attained with CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machines are illustrated here. All are typical parts, with standard tooling or slight alterations on the machine to attain the highest rate of production at the lowest cost and minimum physical effort. Read how CINCINNATI FILMATIC 4" Plain Hydraulics contribute to these desirable results.

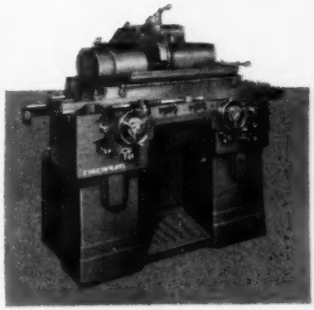
1) FILMATIC grinding wheel spindle bearings require no adjusting or maintenance for years.

2) You can count on quick sizing within .0001", traverse or infeed.

3) The bed is recessed so workers may be seated, yet all operating elements are at their finger tips.

4) Automatic Infeed Attachment controls the complete grinding cycle.

You may obtain more data by writing for literature, or look in Sweet's Mechanical File for brief specifications.



CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machine. Complete specifications may be obtained by writing for catalog No. G-551-1.

CINCI NATI

FILMATIC

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

CENTERTYPE GRINDING MACHINES
CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES
MICRO-CENTRIC GRINDING MACHINES

Keeps INVESTMENT down!

Keeps COSTS down!

If your work falls within the range of the PROMATIC you're in for a pleasant surprise. Here's a machine built to do a job on all work up to 1¼" O.D. at a big saving in first cost and with no sacrifice in production, finish or tolerance. Put the money you save to work on a second machine—and boost your output again!

Handles work up to 1¼" O.D.

Before you buy any centerless grinder get the facts on PROMATIC. Built for PRECISION, built for VALUE, built for SAVINGS!

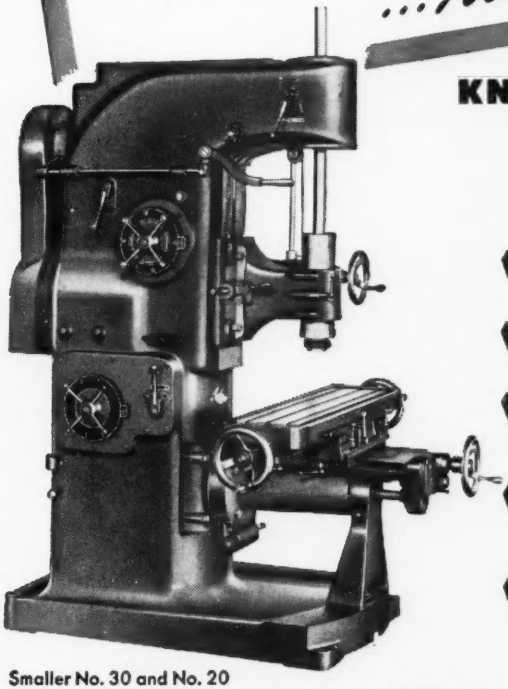
PROMATIC
CENTERLESS GRINDER

DIVERSIFIED METAL PRODUCTS CO.
5125 Alcoa Ave., Los Angeles 58, Calif.

Faster...Better...

PRECISION BORING and VERTICAL MILLING

...At Lower Cost!



KNIGHT'S NO. 40

- ✓ Knight's tilting swivel table eliminates all special jigs and fixtures, even on most complicated jobs.
- ✓ Extreme flexibility and exceptional capacity make work transfers to 2 or more machines unnecessary.
- ✓ 16 Table and spindle feed changes, plus 4 vertical spindle feeds assure greater efficiency from both large and small tools and cutters.
- ✓ Full-vision direction, speed and feed controls—direct-reading speed and feed change dials—fast cutter changes at spindle nose.
- ✓ Rugged 1-piece column construction—precision gearing—wide bearing surfaces insure positive accuracy, long service.

Smaller No. 30 and No. 20 machines also shown in catalog.

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MACHINERY COMPANY

KNIGHT VERSATILE MACHINE TOOLS

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ST. LOUIS 8, MISSOURI

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Send catalog on Knight No. 40 and other milling machines.

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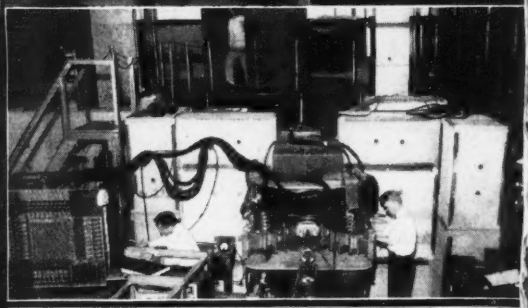
Title_____

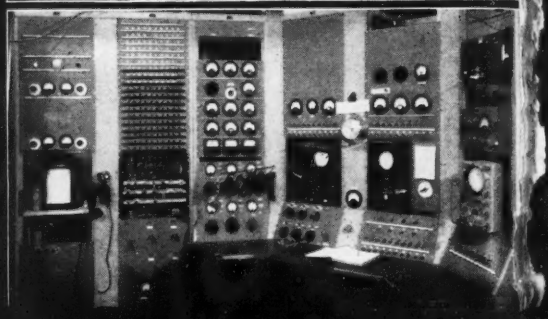
MORE GOODS for MORE PEOPLE at LOWER COST

300,000,000

Precision turning of a special part on the LeBlond Dual-Drive Lathe Cornell University Floyd Newman Laboratory of Nuclear Studies

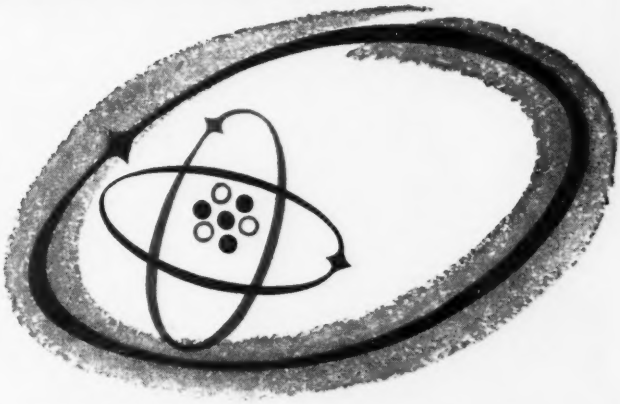


General view of the Cornell Synchrotron Laboratory



Master control panel keeps check on synchrotron

electron volts work here!



Cornell University's synchrotron accelerates atomic particles to energies of 300,000,000 electron volts. It makes possible the study of atomic nuclei and the forces which hold them together.

The Floyd Newman Laboratory of Nuclear Studies at Cornell needed a versatile, precision lathe to turn the myriad of special parts that go into a synchrotron . . . vacuum pump parts and connections, oscillator tube elements, cloud chamber components, plastic lenses, parts for a special stereoscopic camera, and many more.

They installed a new LeBlond Dual-Drive Lathe... recommended by LeBlond Distributor J. F. Owens Machinery Co. of Syracuse, N. Y. Result? Fast, convenient turning of a great variety of special parts to tolerances as low as .0002″.

This new LeBlond Lathe provides hardened and ground steel bed ways; twelve speeds from 28 to 1800 r.p.m., all at full power; 96 feeds from .0004″ to .1062″; 48 threads from 4 to 224; 15″ swing, 3 h. p. motor. It gives you single-lever speed control; positive-jaw feed control; automatic lubrication to headstock, feed box, apron and ways; totally-enclosed quick-change box; and the American Standard taper spindle nose. You get more for your money in a LeBlond Dual-Drive than in any comparable machine.

Likely you'll never build a synchrotron. But for all the turning jobs you do encounter, there's a LeBlond Lathe to turn them faster, better. Your LeBlond Distributor will tell you about our late models. Call him or write—

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for Bulletin No. 4E for more information on the Dual-Drive

turned faster by

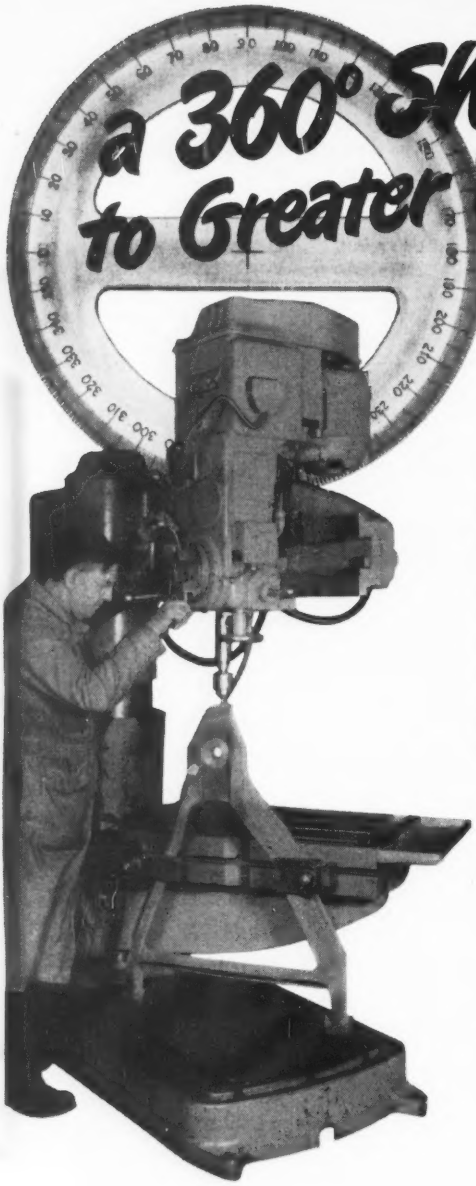
LEBLOND
of Cincinnati

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 63 YEARS

a 360° SWING to Greater Productivity

with a

FOSDICK *Sensitive* RADIAL



The fact that both the arm and the table of the FOSDICK Sensitive RADIAL swing in a 360° arc gives it flexibility that can't be found in any other machine of its type. No matter how big, how small or how intricate your drilling job may be . . . it can be done easier and faster . . . resulting in greater productivity and bigger savings if you put it on a FOSDICK Sensitive RADIAL.

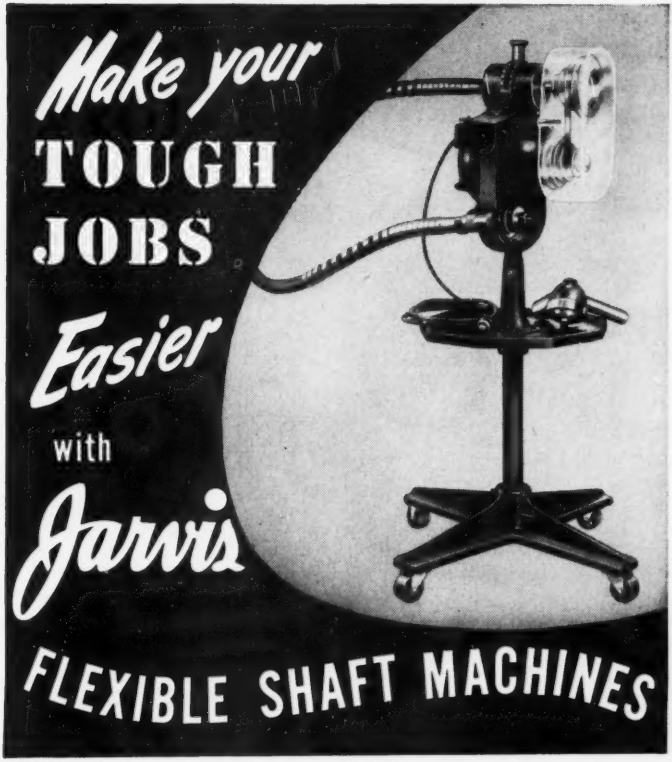
Other time saving, cost saving features of this unique machine tool include:

- Adjustable elevating table which slides smoothly on a sturdy one piece column, placing the work in proper location to the spindle at all times . . .
- Arm at fixed height is easily reached from operator's normal position . . .
- The massive head provides nine speeds and four feeds . . .
- Control levers for both feeds and speeds are direct reading and right at the operator's fingertips.

For complete information on this new, versatile machine write for FOSDICK Sensitive RADIAL Bulletin S.R.M.M.S.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

Make your TOUGH JOBS Easier with Jarvis FLEXIBLE SHAFT MACHINES



Dependable Jarvis Flexible Shaft Machines make your *tough* jobs easier — do them faster and more economically. Made to meet your individual requirements for grinding, cutting, buffing and many other operations, Jarvis Flexible Shaft Machines are available in bench, floor or overhead types — single or multiple speeds. Factory trained Jarvis representatives are ready to help you select the machines best suited to *your* own applications.

Long-lived Jarvis Rotary Files, depended upon the world over, are available in many shapes and flutings. For detailed information on Jarvis Flexible Shaft Machines and Rotary Files, write to The Charles L. Jarvis Company, Middletown, Conn.

Jarvis POWER TOOLS

TAPPING ATTACHMENTS • TECNI-TAPS and DIES • ROTARY FILES
FLEXIBLE SHAFTS and MACHINES • QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

STANDARD Gages

ALL THESE... and MANY MORE

For doing your job better . . . easier!

7 Sizes
Cover Range
⅜" -12⅛"

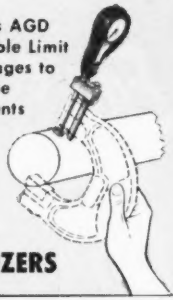
DIAL BORE GAGES

Various Sizes and Graduations

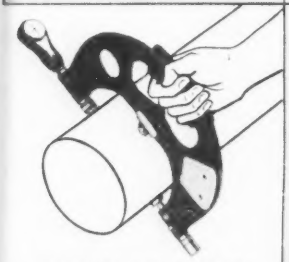
Shockproof

DIAL INDICATORS

Converts AGD Adjustable Limit Snap Gages to Dial Type Instruments

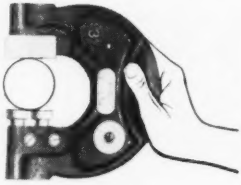


DIALIZERS



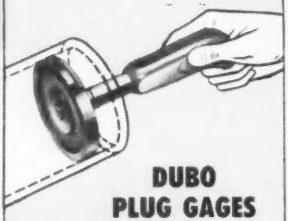
DIAL SNAP GAGES

DIAL COMPARATORS

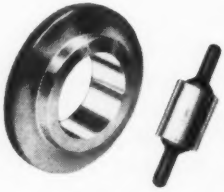


ADJUSTABLE LIMIT SNAP GAGES

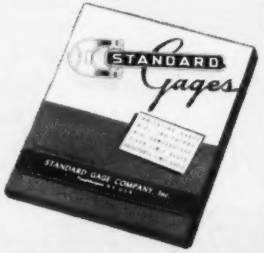
Light in Weight
Sensitive, Definite Check



DUBO PLUG GAGES



MASTER SETTING GAGES



Write for New Catalog B

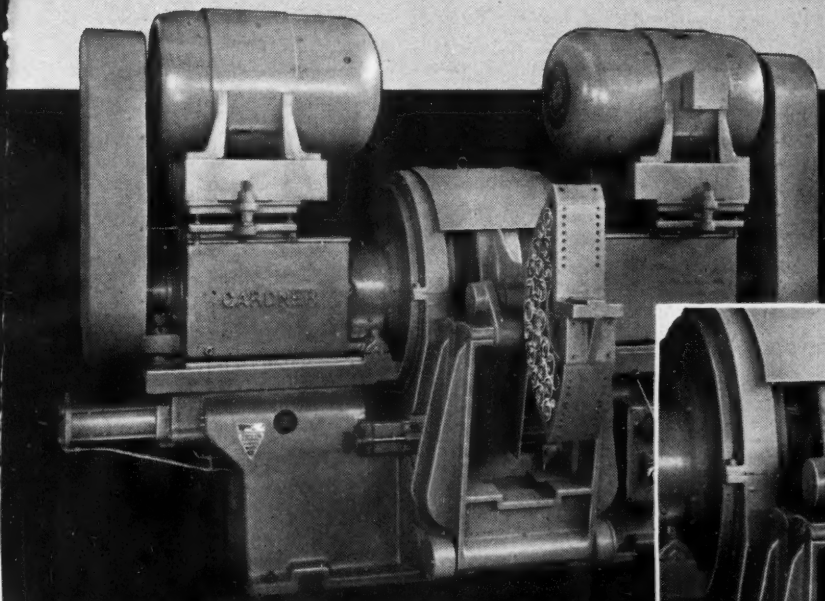
STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

Unit Costs Reduced Grinding 600 Heavy Coil Springs Per Hour

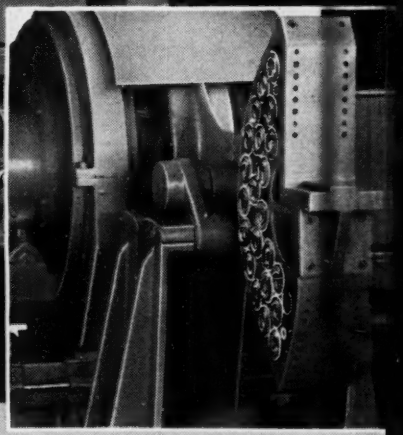
GARDNER

precision disc

TWO ends of each spring ground in ONE operation



Gardner 120A-30" Double Disc Precision Grinder. 1/8" max. stock removal grinding 2 1/2" O.D. steel springs 1/2" diameter wire. Power oscillated swinging arm work carrying fixture.



Indexing-type fixture permits operator to load and unload while grinding.

103 MS

Request bulletin No. 12-7.

GARDNER MACHINE COMPANY

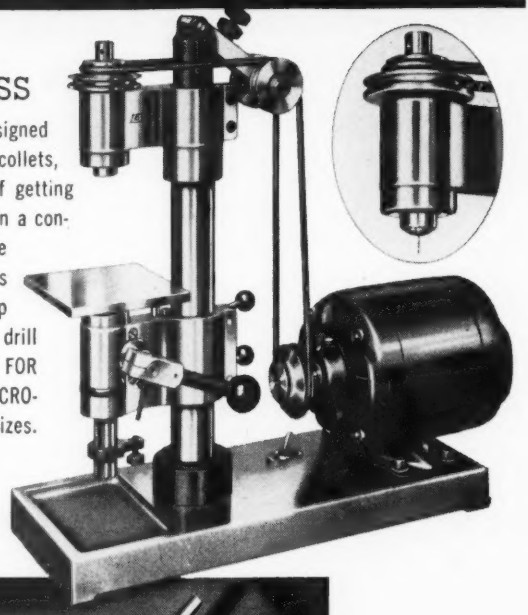
428 East Gardner Street • Beloit, Wisconsin, U.S.A.

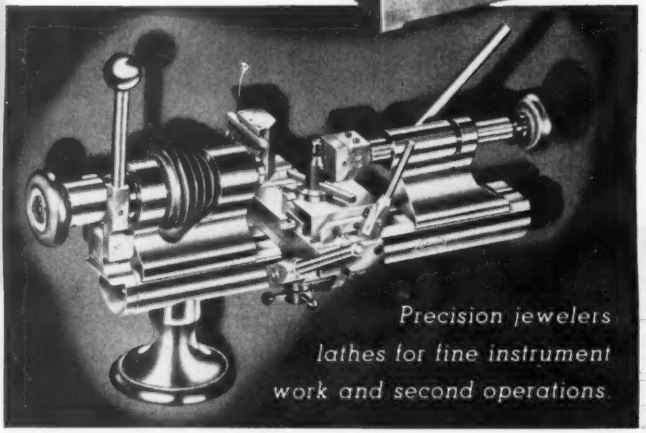
LEVIN® TOOLS ARE DESIGNED
TO MAKE DELICATE PRECISION EASIER

MICRO-DRILL PRESS

The Levin Micro-Drill Press is designed to hold small drills in precision collets, thus overcoming the difficulty of getting a drill to run true as when held in a conventional drill chuck. The absence of a sliding quill guarantees maximum sensitivity with fingertip control. A mounted ⅛" capacity drill chuck can also be used. WRITE FOR BULLETIN H DESCRIBING THE MICRO-DRILL PRESS and listing collet sizes.

for drilling holes as small as .002"





Precision jewelers lathes for fine instrument work and second operations.

SEND FOR CATALOG E DESCRIBING LATHES AND ACCESSORIES

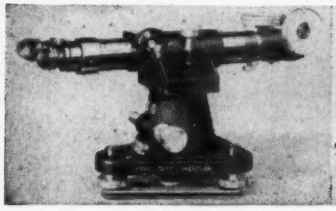
COMPLETE CATALOG illustrates and describes full line of accessories . . . compound slide rests, grinding, milling and screw cutting attachments, cross slide, collet closer and other useful items.

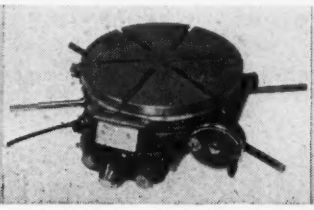
LOUIS LEVIN & SON INC., 782 E. PICO BLVD., LOS ANGELES

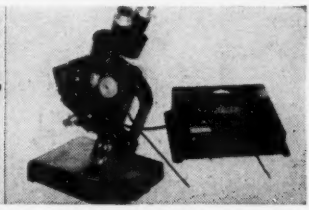
OPTICAL MEASUREMENT at its BEST

a new, improved and complete line

We are proud to offer a line of Optical Measuring Instruments that is unsurpassed for accuracy, fine workmanship and versatility of application. Choose the ultimate in inspection reliability, beyond the possibility of human error. And choose it from the most complete optical line in the country. Here are a few important instruments, of typical quality.







Alignment Telescope

The new Leitz instrument provides a purely optical method of checking alignment of machine tool beds, crank case bearings, shafts, engine bores and testing machine tool ways for straightness. These and other difficult engineering tests are now reduced to a routine operation that is positive and takes but a fraction of the time needed by other than optical methods. Complete instrument comprises a telescope proper, micrometer measuring attachment, leveling stand and target with illuminator.

Optical Circular Table

This unit, the acme of precision in circular tables, provides optical readings independent of worm gears or other wearing, error-creating parts in two second graduations. Designed for use with jig boring machines, toolroom milling machines or wherever highly accurate rotary indexing is required. Scale is projected and can be read over prolonged periods without eyestrain.

Binocular Comparison Microscope

An indispensable instrument for direct examination of surface finish by comparison of work with a master specimen. The two three-dimensional images appear side by side, clearly. Easily regulated direction of illumination for best results and most distinct definition.

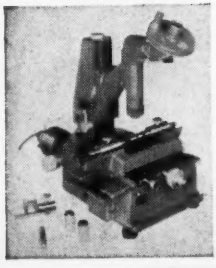
MICROSCOPES for the SHOP

Simplified Shop Microscope

There are many uses, in any shop, for this fine, optical instrument which measures linear dimensions outside the range of mechanical means by simply moving the microscope tube by a micrometer slide. Ideal for inspection on dies, fine wire diameters, Brinnell impressions and similar work. Rack and pinion focusing motion. Range: 2"; readings in .0001"; magnification, 35x.

Binocular Microscope

A stereoscopic, fully erect image instrument of long focal range and wide field, which brings out texture, grain or surface defects without eyestrain. Easily attached to machines. An Osterman Attachment is available to simplify the counting of fine grains divisions, screens or threads in fabrics.



Improved Toolmaker's Microscope

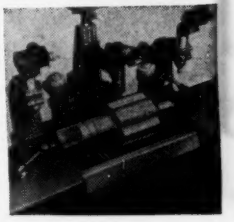
A shop tool with laboratory precision, this Leitz Measuring Microscope features the "Intermediate Image" which permits work to be inspected through a wide range of magnification with the same templates. Eliminates scale drawings, and conventional sources of error. A natural size master part may be used as standard for comparison. Can be used for large profiles and work pieces to coordinate dimensions, 4"x1" —Other sizes available.

Small Toolmaker's Microscope

This Leitz Microscope combines scientific laboratory accuracy, simple, fast operation and ruggedness and enables the average shop to attain peak results at low cost. A fully universal instrument of 2"x2" total range; 2⅜" swing; 5" centers; and 30x magnification. Perfect for shops producing watch parts, tools, dies, templates, thread gages and taps.

Strasman Microscope

This large Leitz Strasman Microscope, one of the outstanding units in the Leitz line, is fully optical and is designed for large flat or cylindrical work within its capacity. Fine workmanship guarantees reliable results under any shop conditions and over long periods of time. Direct measuring range is 40" long by 8" wide, up to 10" swing.



Other fine tools in the optical line include Thickness Measuring Instruments and Comparators. Complete information on this universal optical line is available upon request.

GEORGE SCHERR CO., Inc.

198A LAFAYETTE STREET
NEW YORK 12, N. Y.

HERE'S WHY...

If you plan to produce small arms ammunition, artillery cases, projectiles, military vehicles, aircraft parts, fuses, chemical containers or any one of thousands of pressed metal components for ordnance materiel—Bliss is the company best qualified to recommend both the equipment and methods. For Bliss designed and built more pressed metal machinery than any other company during World War II. It's logical to call on Bliss because:

Bliss has the engineering experience—over 90 years of it—and the manufacturing capacity—four plants—*to equip complete projects.* Bliss builds more types and sizes of presses than any other company in the world.

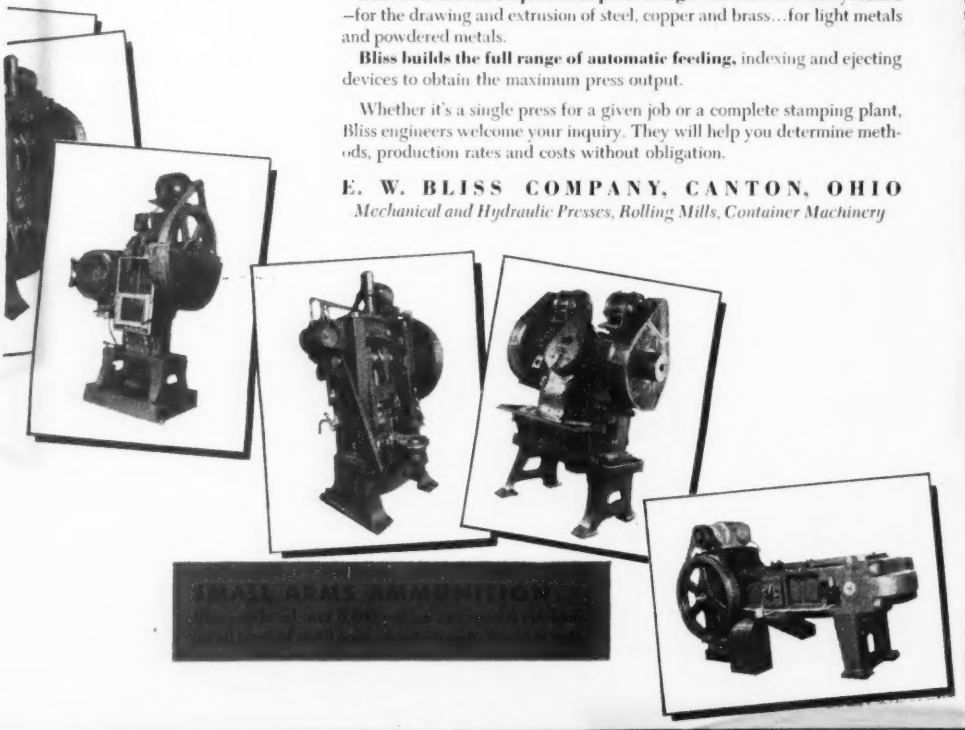
Bliss is skilled in all phases of press design—mechanical and hydraulic—for the drawing and extrusion of steel, copper and brass...for light metals and powdered metals.

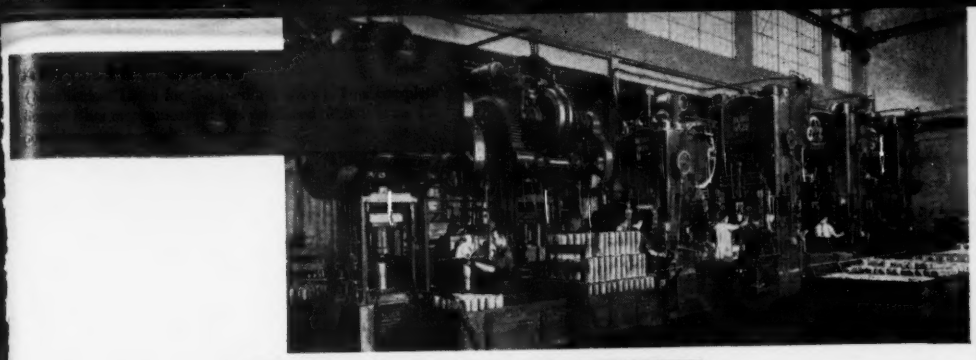
Bliss builds the full range of automatic feeding, indexing and ejecting devices to obtain the maximum press output.

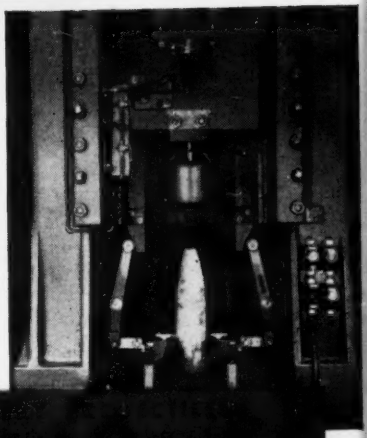
Whether it's a single press for a given job or a complete stamping plant, Bliss engineers welcome your inquiry. They will help you determine methods, production rates and costs without obligation.

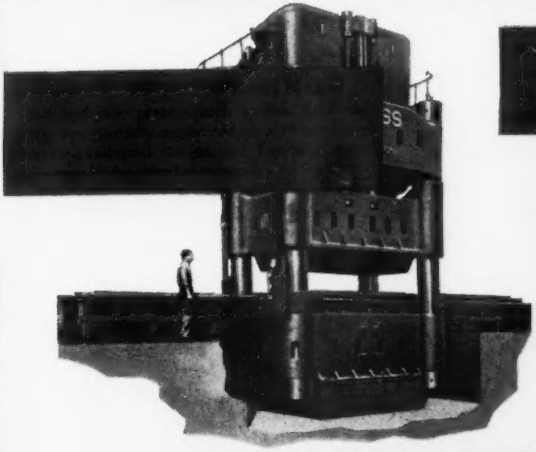
E. W. BLISS COMPANY, CANTON, OHIO

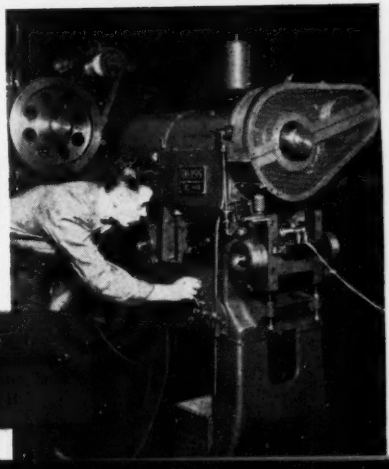
Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery











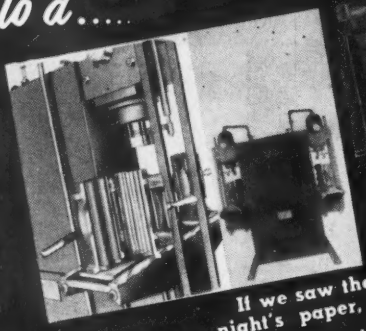
This ad....

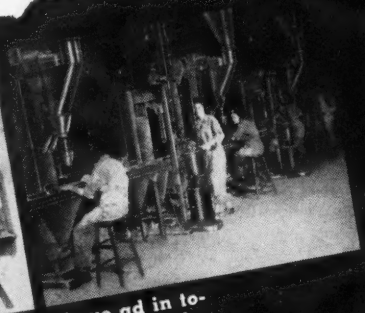
FITS KRW

to a.....

HELP WANTED

Wanted: Company to design and build shell loading hydraulic presses. Must be fast, efficient and engineered for safety. World War II experience preferred.





If we saw the above ad in tonight's paper, we'd reach for the phone . . . quick! The job's made to order for K. R. Wilson. Hundreds of KRW 2-station and 4-station shell loading presses were supplied to bomb loading contractors during World War II. The photo at left above shows a close-up of the shell case holder on a KRW 4-station shell loader (shown in inset). At right is a battery of KRW presses in one of the nation's largest arsenals.

We're set to do an even bigger job today. Almost two million dollars in new machinery and equipment have been added to our plant since World War II. So if you have shell-loading contracts, contact KRW for the right equipment.

Send for

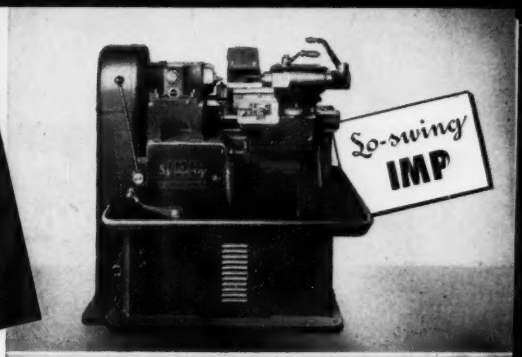
FREE NEW BOOKLET

It tells all about our plant, equipment, facilities and experience in war and peace-time production. It's yours for the asking. Write Dept. 16.

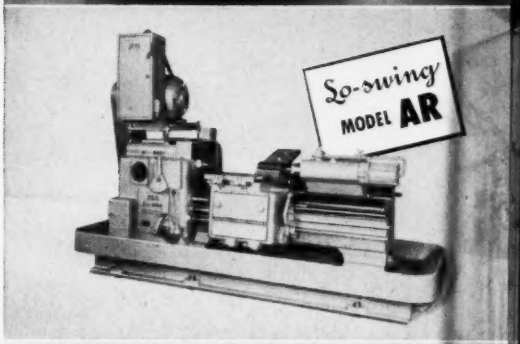
K·R·WILSON

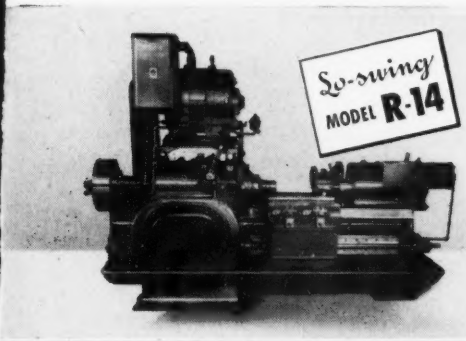
215 MAIN ST. BUFFALO 3, N. Y.

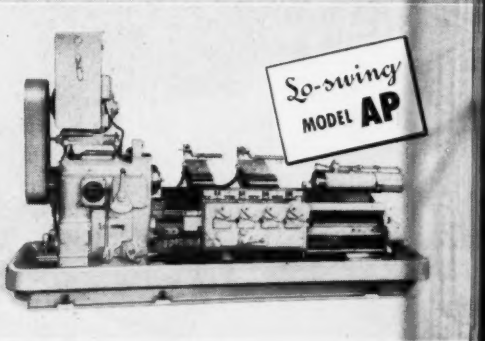
PRODUCTION COSTS ARE LOWER WITH Lo-swing

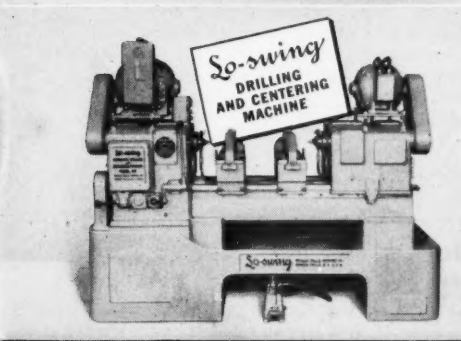


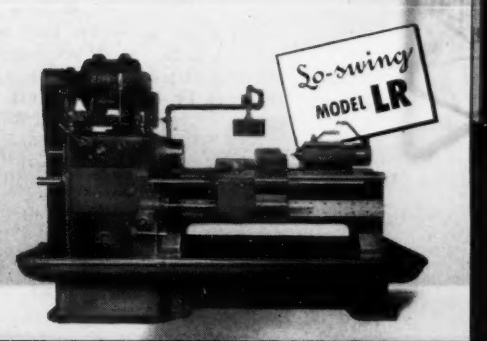
● There is a Lo-swing *full* or *semi*-Automatic Lathe for practically *any* production turning job . . . automotive, industrial or ordnance. Write for Catalog No. 50 describing these, and other, cost-cutting Seneca Falls machines.











SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

MORRIS SAVINGS IN DETROIT...

show up in Anytown U.S.A.

On the six-station Morris High Production Machine shown here, 11 holes are drilled in this camshaft at a rate of 89 pieces per hour at 80% efficiency.

There probably isn't a popular make automobile that doesn't have several of its parts mass-produced for less on a MORRIS High Speed Production Machine. And the savings . . . in Detroit, Flint, Lansing or other auto centers . . . finally show up where they count most, in the delivered price of your car in ANYTOWN, U. S. A. • If you have a multiple machining process involving drilling, reaming, tapping or similar operations, consult Morris Engineers. Without cost or obligation, they may be able to suggest a solution . . . prove a MOR-SPEED unit can produce more parts—in less time—at lower cost—to highest standards.

THE MORRIS MACHINE TOOL COMPANY

"A better product at less cost— with MORRIS ENGINEERED PRODUCTION"

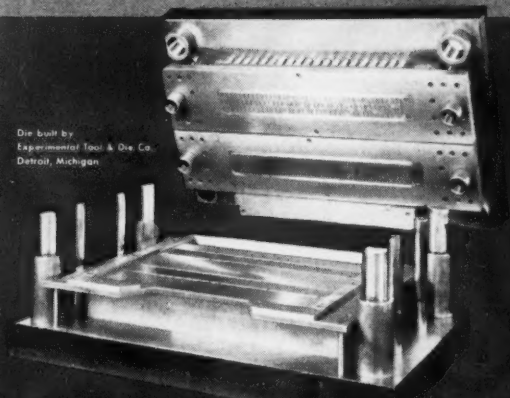
Builder of MOR-SPEED Line

934 HARRIET STREET CINCINNATI 3, OHIO

PIECE PART REJECTIONS REDUCED

90%

Diemakers at Experimental Tool & Die Company solved a costly repair soldering problem on these stamped radiator heads with the die shown below. Precision was the secret. Die tolerances were held to within .0001" and all die components had to be interchangeable. That's why they specified . . .



Die built by Experimental Tool & Die Co., Detroit, Michigan

DANLY

DIEMAKERS' SUPPLIES and PRECISION DIE SETS

Die Sets · Dowel Pins · Die Springs · Cap Screws · Stripper Bolts

CALL ON THE DANLY BRANCH CLOSEST TO YOU FOR FAST LOCAL SERVICE

*CHICAGO 50, 2100 South Laramie Avenue
*CLEVELAND 14, 1550 East 33rd Street
*DAYTON 7, 3196 Delphos Avenue
*DETROIT 16, 1549 Temple Avenue
*GRAND RAPIDS, 113 Michigan Street N.W.
INDIANAPOLIS 4, 5 West 10th Street
*LONG ISLAND CITY 1, 47-28 37th Street
*LOS ANGELES 54, Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2, 111 East Wisconsin Avenue
PHILADELPHIA 44, 18 West Chelten Avenue
*ROCHESTER 4, 16 Commercial St.

*Indicates complete stock

Diemakers everywhere depend on Danly precision. Every Danly product—die sets, dowel pins, die springs, cap screws, stripper bolts—is designed to complement the finest die work. For complete, reliable service, come to Danly!

DANLY

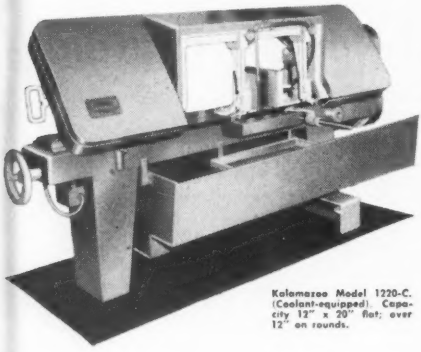
DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

THE NEW "1220" Kalamazoo

METAL CUTTING BAND SAW

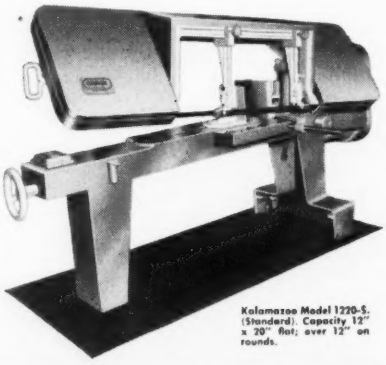
- Big, Rugged Capacity At Much Lower Price!
- 4 Cutting Speeds!
- 45° Swivel *Leaf-Type* Vise!
- Quick, Easy, Half-Minute Blade Changes!
- Full 1 HP Motor!
- Unique Dash-Pot Mechanism For Controlled, Constant Pressure On Cuts!
- Unobstructed View of Cutting Operation!
- 1" Blade For More Speed and Precision on Cuts!



Kalamazoo Model 1220-C. (Coolant-equipped). Capacity 12" x 20" flat; over 12" on rounds.

A *big* saw—a *rugged* saw—a saw especially designed for *fast, efficient, precision cutting* of oversize bars, rounds, tubes, pipe, angles, and odd production shapes! . . . *priced way below all other saws of near-equivalent capacity* . . . that's the new Kalamazoo 1220! It's ready to go to work for you on heavy-duty production cutting of metals hour after hour, job after job—month in and month out. The 1220 in your plant will speed production and slash unit cutting costs on intermittent or continuous cutting. It has every feature—many of them exclusive—to do a better cutting job for you at new low cost.

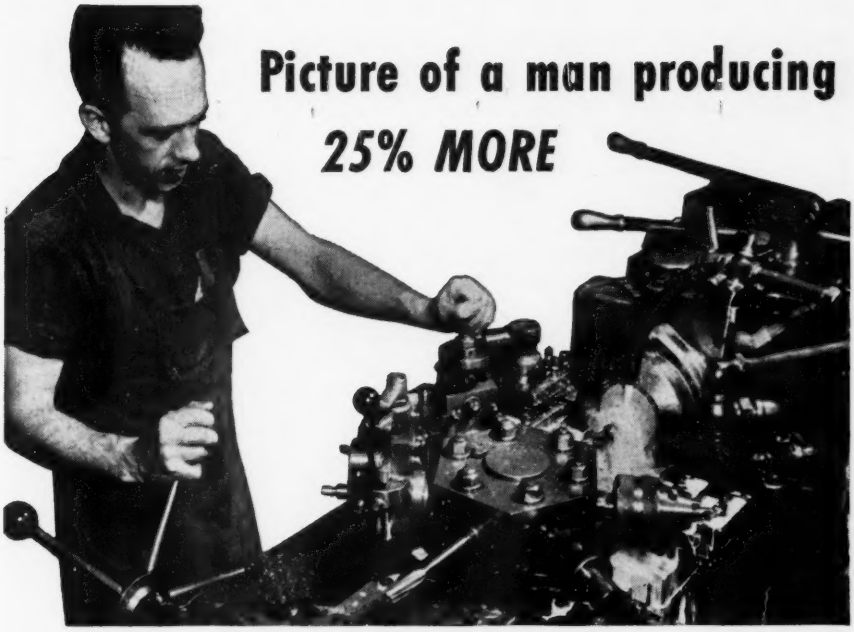
For continuous high-speed heavy-duty cutting, the 1220 coolant model, above, fills the bill. It handles prolonged production runs with ease—*cuts to an accuracy of a few thousandths with no burr, minimum kerf.* It is exceptionally rugged and rock solid—maintains precision from start to finish on every job, every cut. For heavy-duty cutting where operation is not continuous, or where non-ferrous metals are cut, the 1220 standard model, at right, is ideal. Identical with the coolant model except for the coolant system. Has the same speed, precision, and power for outstanding heavy-duty performance. Send for complete descriptive literature today.



Kalamazoo Model 1220-S. (Standard). Capacity 12" x 20" flat; over 12" on rounds.

MACHINE TOOL DIV. Kalamazoo TANK and SILO CO.

722 HARRISON STREET • KALAMAZOO, MICHIGAN



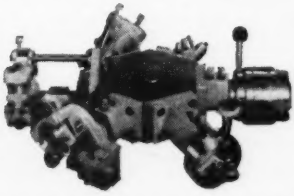
SAME JOB, SAME OPERATION

but better tools!

● Electrol Incorporated, of Kingston, New York, transferred this precision Stop-Plunger job to a Warner & Swasey No. 3 Universal Turret Lathe because it had the speed and accuracy required, as well as the proper tooling for the job. The result was a 25% increase in production of this high pressure hydraulic control part.

This shop has found it can do more jobs faster on Warner & Swasey Turret Lathes with the Standard Tooling Setups that fit their requirements. Multiple and combined cuts, with shorter setup time, mean profitable production increases.

WARNER & SWASEY
Machine Tools
Cleveland



TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

Here's a Proved way to set High-Standards in Design

When you've been around for 40 years you're bound to earn some sort of reputation. That's happened to Norma-Hoffmann bearings, and, in thousands of blueprints it gets put down in "blue and white" like this: *Norma-Hoffmann or equal.*

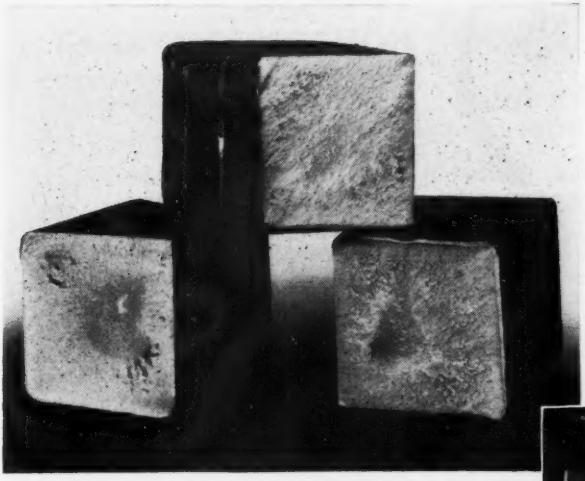
Designers tell us there are extra values in these bearings. That they can specify Norma-Hoffmann and right there a worry is off their minds.

We have certainly set up high enough standards to assure delivering these extra qualities. There's no secret how. It's explained in one word: *precision.*

NORMA-HOFFMANN
Precision
BEARINGS
BALL • ROLLER • THRUST

NORMA HOFFMANN BEARINGS CORPORATION, STAMFORD, CONNECTICUT • FIELD OFFICES: Chicago, Cleveland, Detroit, Cincinnati, Los Angeles, San Francisco, Dallas, Seattle.

DO YOU KNOW THE ADVANTAGES OF *SHEARING* BILLETS OVER NICKING AND BREAKING?



- HIGH[illegible]
- CLEAN, SQUARE CUTS
- UNIFORM, SHEARED PIECES

Above are sections of 4½-inch alloy steel billet cut by a "Buffalo" Billet Shear, showing the clean, square cuts produced. There is no "smearing" of the metal, or "notches" on one edge, as in nicking and breaking. "Pipes" in the billet could be easily detected. Sheared pieces are kept to uniform weight, and there is no expense for gas and burner. Best of all, these pieces are cut at the rate of *10 per minute!* "Buffalo" Billet Shears are built in sizes to handle up to 10-inch rounds and 9-inch squares. HUNDREDS are in use! WRITE FOR BULLETIN 3295-A, for facts on lower cost shearing of billets.

BUFFALO "Buffalo" FORGE COMPANY
388 Broadway Buffalo, New York
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

LOOK

Honing the bore of a gas engine cylinder

FULMER

COMPLETE HONING EQUIPMENT

EVERYTHING YOU NEED IN ONE "PACKAGE"

HONING MACHINES
15 sizes, diameters from 1/4" to 30" with strokes from 12" to 84"

HONING TOOLS
sizes to 50"

HONING FIXTURES
designed for your special purposes

PHOTO shows a Fulmer Vertical Honing Machine, honing the bore of a gas engine cylinder, being built by the Continental Gin Co. The Fulmer vertical honing machine is equipped with a hone of 14 inches diameter and finishes the bore to within 0.002 inch limit of finish size and to a maximum surface variation of 35 to 45 micro inches. After the honing operation has been completed, the bore is gaged to make sure it is within the specified limits for diameter. **EXTREME ACCURACY AND FAST PRODUCTION ARE *ASSURED.***

ONLY FULMER can furnish COMPLETE honing equipment FOR ALL SIZES.

WRITE TODAY . . . GET BULLETIN 10

C. ALLEN FULMER CO.

1233 First National Bank Bldg.
Cincinnati 2, Ohio

Only MARVEL *builds all four**

While it is true there are several builders of hack sawing machines and many builders of band sawing machines, only MARVEL builds *BOTH* hack saws and band saws. The fact is that MARVEL manufactures 35 models of 10 basic types of metal sawing machines which include the world's fastest automatic production saw, the world's largest giant hydraulic hack saws, the world's most versatile band saw and the most widely used small shop saws.

With intimate and broad field experience in all types of metal cutting-off equipment and 35 different saws available, it is obvious that MARVEL Field Engineers occupy a unique and exclusive position in the industry. They are eminently qualified to make expert and *unbiased* recommendations covering the type, size and model of metal sawing equipment best suited to individual requirements—the most efficient, most accurate, fastest, broadest in scope and the most economical.

MARVEL is also the only manufacturer of both metal sawing *machines* and metal sawing *blades*. Because the efficiencies of both the machine and the blades are interdependent, each upon the capability of the other, expert knowledge covering both saws and saw blades is essential to the proper appraisal of any specific sawing situation. Correct balance of cutting speed and blade life, feed pressure and blade tension are all potent factors in over-all performance. Here again it is the MARVEL Field Engineer who is qualified to provide the comprehensive answer to your question. His job is to help you saw metal most efficiently—his services are available upon request—gratis.

Write for Catalog 49

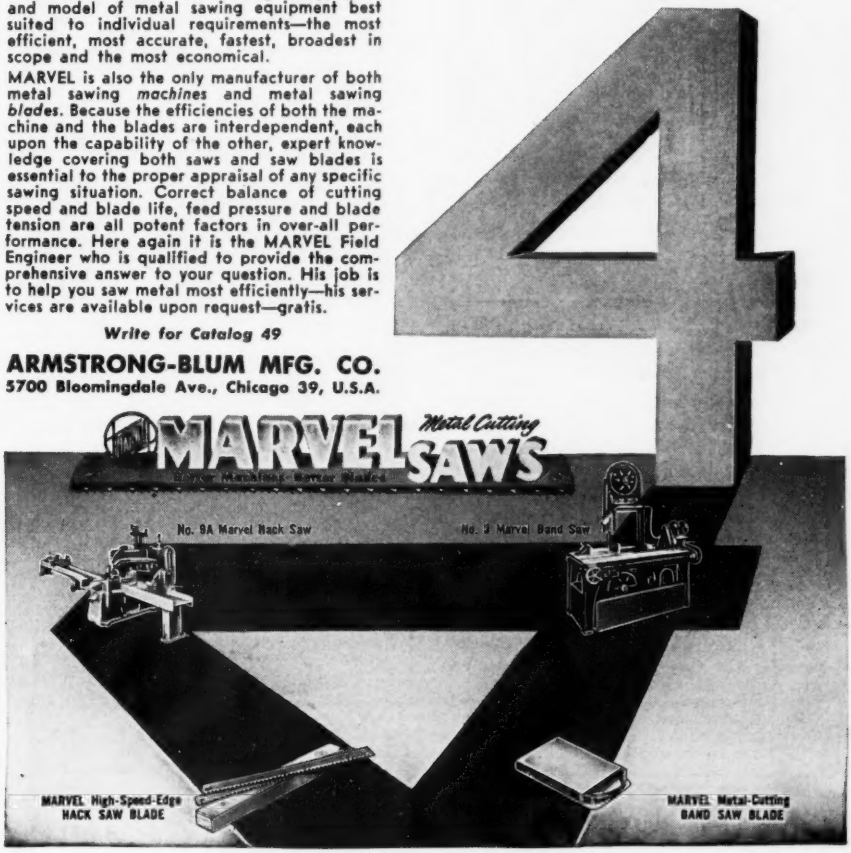
ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Ave., Chicago 39, U.S.A.

***HACK SAWING MACHINES**

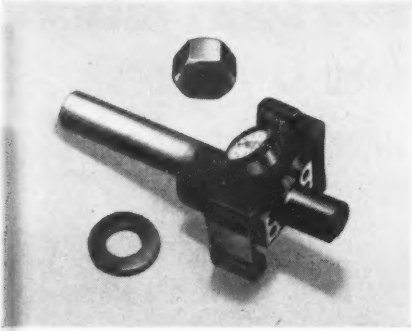
***BAND SAWING MACHINES**

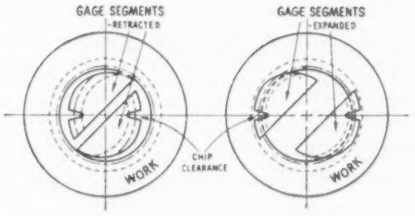
***BAND SAW BLADES**

***HACK SAW BLADES**


MARVEL Metal Cutting SAWS
No. 9A Marvel Hack Saw
No. 3 Marvel Band Saw
MARVEL High-Speed-Edge HACK SAW BLADE
MARVEL Metal-Cutting BAND SAW BLADE

The new Bryant Internal Thread Gage will check parts 4 to 5 times faster!





Plug segments are collapsed so gage may be inserted or withdrawn without threading.

Plug segments are expanded to give full length contact on all the threads.

The new Bryant internal thread gage is based on the principle of a split plug gage. The plug segments are collapsed by a thumb lever and inserted into the threaded hole. When the thumb lever is released, the plug segments expand to contact the internal threads in the parts being inspected.

This new gage is portable, therefore, threads may be checked while the part is chucked in a machine, and it offers extra convenience when inspecting threads in large, heavy casting that cannot be moved conveniently.

The Bryant gage is designed to give one accumulated reading of P. D., form and lead on the dial indicator. For the first time it is now possible to sort parts into known classifications for fit (assemble-ability). This gage is used for the inspection of internal threads in a range from 5/16" to 1" diameter. Interchangeable segments are easily attached to the gage to cover a wide range of thread sizes. These segments are made to the same tolerances in P. D., lead, and form as a Class "W" Master. The life of the segments is lengthened by the fact that the gage does not have to be screwed into or out of the threaded hole – a partial turn gives a full reading on all the elements of all the threads.

Actual tests show that the Bryant portable internal thread gage will check parts four to five times faster than the standard plug gage!

MAIL THE COUPON FOR FURTHER INFORMATION

COUPON

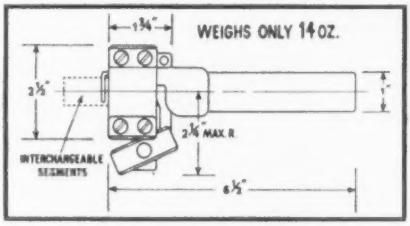
Please send me complete details on the New Bryant Portable Thread Gage.

NAME_____ TITLE_____

COMPANY_____

STREET_____

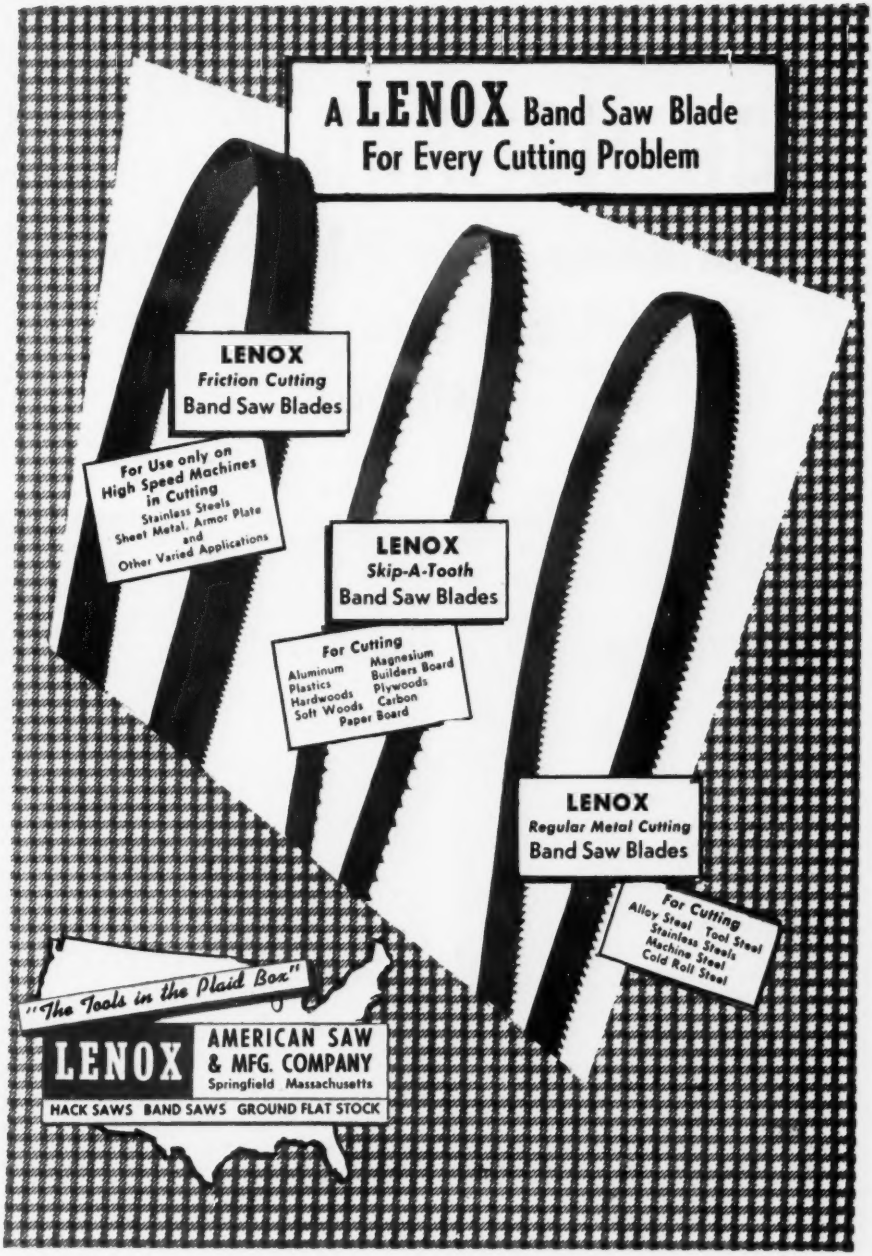
CITY_____ STATE_____



BRYANT

CHUCKING GRINDER CO.

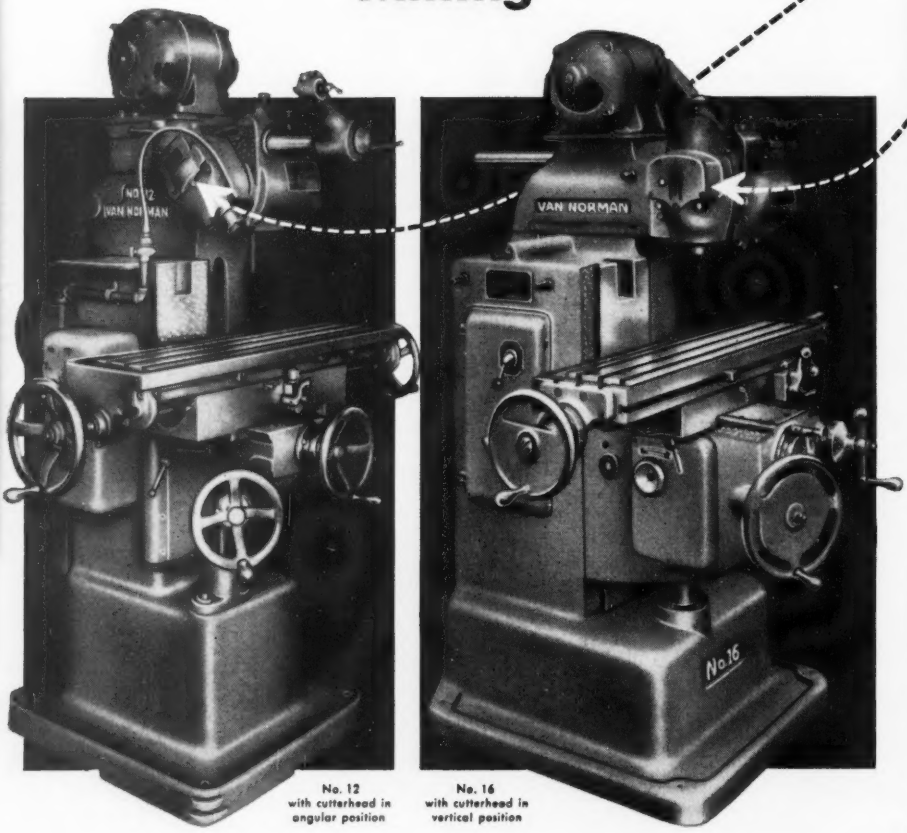
SPRINGFIELD, VERMONT, U. S. A.


A LENOX Band Saw Blade
For Every Cutting Problem
LENOX
Friction Cutting
Band Saw Blades
For Use only on
High Speed Machines
in Cutting
Stainless Steels
Sheet Metal, Armor Plate
and
Other Varied Applications
LENOX
Skip-A-Tooth
Band Saw Blades
For Cutting
Aluminum
Plastics
Hardwoods
Soft Woods
Magnesium
Builders Board
Plywoods
Carbon
Paper Board
LENOX
Regular Metal Cutting
Band Saw Blades
For Cutting
Alloy Steel
Stainless Steels
Machine Steel
Cold Roll Steel
Tool Steel
"The Tools in the Plaid Box"
LENOX
AMERICAN SAW
& MFG. COMPANY
Springfield Massachusetts
HACK SAWS BAND SAWS GROUND FLAT STOCK

These Two

Van Norman Millers

Will Keep Your Production Up on Light and Medium Milling



No. 12 with cutterhead in angular position

No. 16 with cutterhead in vertical position

The Adjustable Cutterhead Eliminates Idle Machine Time... Meets All Milling Requirements

Here are two Van Norman Ram Type Millers, No. 12 and No. 16 that provide definite contributions to faster, more economical milling of small and medium size parts.

Featuring the adjustable cutterhead, which permits conventional horizontal, angular and vertical milling on one machine, these millers cut idle machine time by as much as 50%.

The movable ram in combination with the saddle cross feed increases the work capacity of the millers . . . enables you to handle all types of work pieces with ease.

Van Norman features include — rugged column and base, hardened alloy steel gears, multi-splined shafts, easy-to-read dials, large hand wheels, heavy knee, saddle and table assembly, anti-friction bearings, ease of operation.

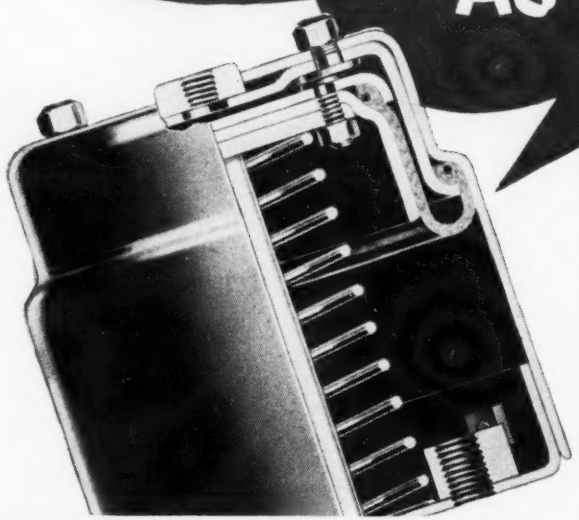
See for yourself how these machines cut costs, improve accuracy and increase production in the toolroom, machine shop, laboratory and pattern shop and on the production line. Write for catalog today.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

ON OLD OR NEW MACHINE TOOL OPERATIONS—

YOU CAN STEP UP YOUR PRODUCTION AS MUCH AS 30%



....WITH THIS SIMPLE, RUGGED, LOW COST AIR CYLINDER!

The pressure for production is on! Manufacturers everywhere find it increasingly difficult to keep pace with the demands of the day. But there is a way—a brand new way requiring no addition to manpower, no addition to plant facilities. The answer? Remarkable Bendix-Westinghouse Robotair Industrial Controls. With their wide range of applications, Robotair controls offer you amazing improvements in production speed and economy through increased productivity of man and machine at *unbelievably low initial cost*. Robotair units are available as original equipment for machinery

manufacturers or for easy installation on shop equipment.

Send today for an informative booklet and find out how you can cut costs, speed production with Robotair! Address Bendix-Westinghouse Automotive Air Brake Co., Dept. F, Elyria, Ohio.

FOR HOLDING, CLAMPING, BENDING, SWEDGING, STAKING, RIVETING

ROBOTAIR

THE INDUSTRIAL AIR CONTROL OF A THOUSAND USES

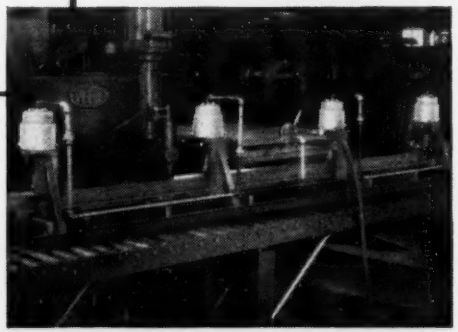
CHECK THESE FEATURES:

- ★ Frictionless
- ★ Leakproof
- ★ 100% efficient for total life
- ★ No oilers or filters needed
- ★ Holding pressures up to 5000 lbs.
- ★ Diaphragm has rolling action and exceptionally long life
- ★ Made from high grade steel stamping—all metal parts cadmium plated
- ★ Chrome Molybdenum Steel Push Rod heat-treated for maximum toughness
- ★ Easily installed

BENDIX-WESTINGHOUSE ROBOTAIR
REG. U. S. PAT. OFF.

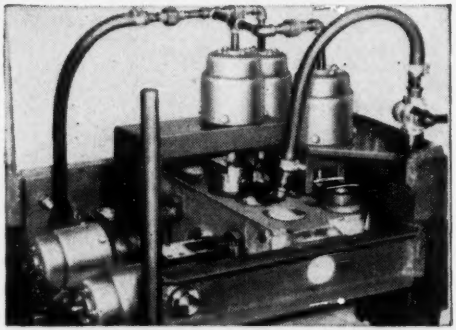
Bendix-Westinghouse

Bendix-Westinghouse Automotive Air Brake Company
Elyria, Ohio



REDUCES OPERATOR FATIGUE

Four Rotochambers installed on the fixture in this spot welding operation replaced cumbersome hand clamps, saving time, greatly reducing operator fatigue.



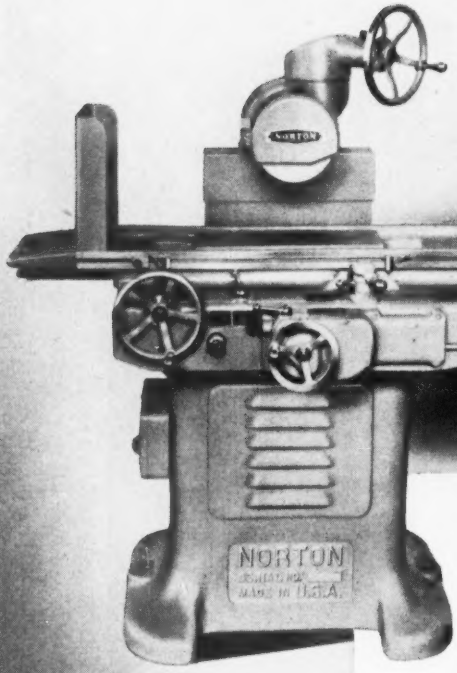
SPEEDS INSPECTION METHODS

Installation of Rotochambers on this water test operation for engine castings eliminated hand operated fixtures, thereby speeding inspection and cutting costs.

Better Tool Room Grinding...

That's what you get

6"

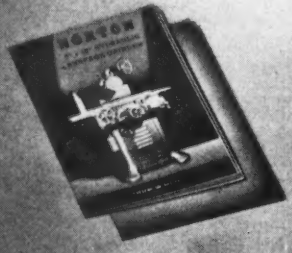


6" x 18" HYDRAULIC SURFACE GRINDER

The ideal small surface grinder for quick setup and fast accurate grinding of the hundreds of small flat parts common to every tool shop. Accurate for flatness and parallelism within "tenths."

Like the larger 8" machine it will stand up for steady production line work within its capacity.

Send for Catalog No. 954-14



Abrasives · Grinding Wheels · Grinding and Lapping Machines · Refractories · Porous Mediums · Non-slip Floors · Norbide Products · Labeling Machines

Faster Production Grinding . . .
with these NORTON SURFACE GRINDERS

8" x 24" HYDRAULIC SURFACE GRINDER

Combines the convenience of simple controls and the ruggedness for high production manufacturing operations with the high degree of accuracy and adaptability for a wide variety of tool room grinding.

Easy to set up — easy to operate — and hard to beat for quantity and quality of work.

Send for Catalog No. 190-3

M-585

NORTON GRINDERS

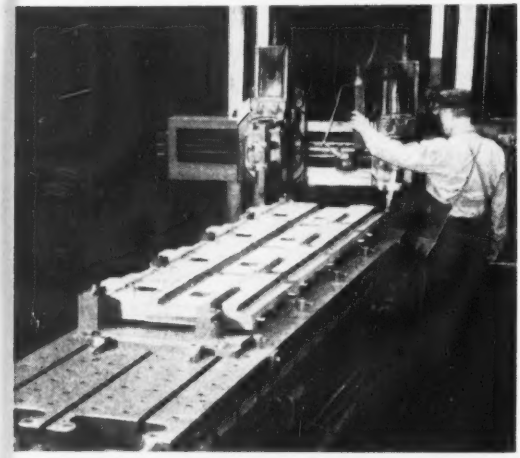
NORTON COMPANY, WORCESTER 6, MASS. - New York - Chicago - Detroit - Cleveland - Hartford - Distributors in All Principal Cities

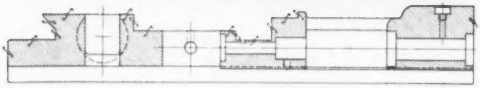
CINCINNATI HYPRO PLANER

HOLDS IMPORTANT CROSS CARRIAGE BEARING SURFACES

parallel and flat!

Six horizontal and seven vertical surfaces and dovetail on each of these four turret lathe cross carriages are rough, semi-finish and finish planed and held to ±.001" Planing maintains the parallelism necessary to fit hardened and ground steel ways in subsequent assembly operations. With this Cincinnati Hypro machine using a single tool, danger of distorting or warping the intricate castings is eliminated. There is no problem of heat generation. Flatness of each part and relationship of each planed surface one to the other is easily maintained.





Typical Operations, Speeds and Feeds

1. Rough 6 horizontal surfaces and 2 lugs.
2. Rough and finish plane 2 carriage ends, using rail heads simultaneously.
3. Rough 7 vertical surfaces and dovetail.
4. Repeat 1 and 3 as semi-finish operations.
5. Repeat 1 and 3 as finish operations.
6. Remove parts for subsequent machining.

Speeds:
145 F.P.M. roughing with 210' return speed
90 F.P.M. semi-finish with 190' return speed
90 F.P.M. finish with 190' return speed

Depth and Rate of Feed:
Horizontal Surfaces
Roughing 5/16" at .045"
Semi-finish 5/16" at .010"
Vertical Surfaces
Roughing 1/8" at .045"
Semi-finish 1/8" at .045"

Cutters:
Carbide tipped tools

PRODUCE *More at Low Cost* with these other HYPRO MACHINES*

Openside Planers
Planer Type Milling Machines
Frog and Switch Planers
Vertical Boring and Turning Mills
Special Planers and Boring Mills

* Optional with non-metallic table ways if desired.

G&L HYPRO

GIDDINGS & LEWIS MACHINE TOOL CO.
126 DOTY ST. • FOND DU LAC, WISCONSIN

WESSON METAL IS PRODUCING

MANY MORE "CONTROLLED" LOTS OF WESSONMETAL

TO MEET THE EVER INCREASING DEMAND FOR THIS IMPROVED CARBIDE!

WESSONMETAL

★ Solid Carbide Blades
★ Standard and Special Carbide Tips
★ Solid Carbide Shapes

6 STANDARD GRADES . . . 2 SPECIAL GRADES TO MEET HIGH SPEED AND HIGH FEED RATES OF MODERN MACHINE TOOLS

Uniform dependability is maintained in Wessonmetal because it is quality controlled by Wesson's exclusive method of small lot production. Each lot is carefully processed—rigidly inspected to maintain uniformity—highest possible quality. Whatever your needs in Solid Carbide —you can depend on Wessonmetal for Quality, Economy and Efficiency.

Write for Bulletin

WESSON METAL CORPORATION
Lexington, Kentucky
Affiliated with **WESSON COMPANY**

PIONEERS IN THE ART OF DESIGNING AND PRODUCING CARBIDE TOOLS

New TITCOMB

SEGMENTAL CHUCK

SLASHES GRINDING COSTS

Check the many advantages of this revolutionary new chuck when it is used in combination with tried and proved Robertson Segments . . .

LOW COST. Novel design of segment gives the lowest cost per cubic inch of usable abrasive. By actual grinding tests, three to four inches of metal are removed for every inch of abrasive loss.

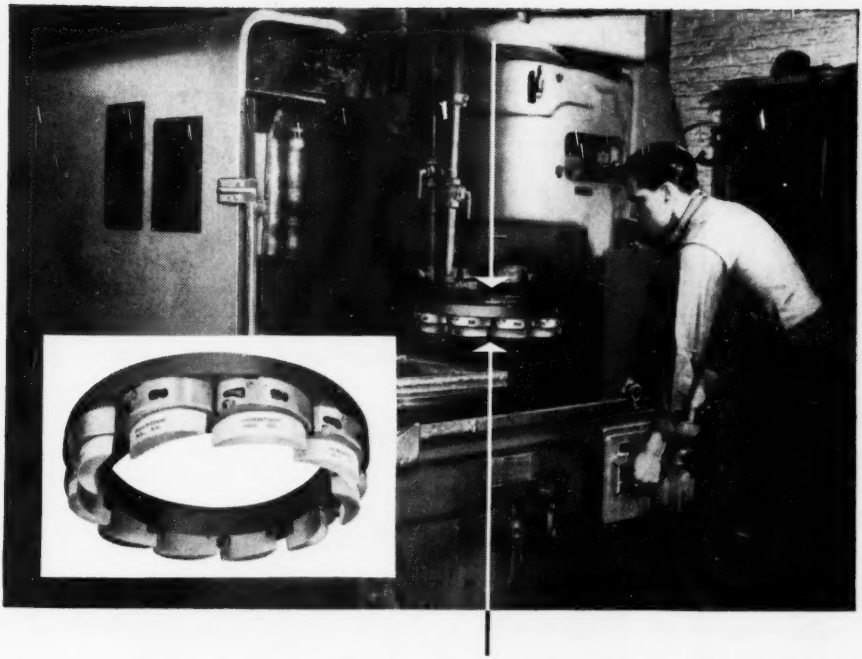
FASTER CUTTING. Unique design produces a plowing action. This, plus centrifugal force, sweeps chips and dirt from the work surface.

CONTINUOUS CUTTING. Overlapping segments assure continuous cutting . . . leave plenty of space for chip clearance.

LESS WASTE. Clamping device with safety wedge action and integral segment adjusting plate reduces segment waste. No special skill is required to load the holders.

SIMPLIFIES BUYING. Regardless of the size of the chuck, one size segment covers all vertical spindle surface grinding requirements.

ROBERTSON COOL-CUT



If you are now using Robertson Wheels or Segments, you know you can count on them for top performance. Even so, you will be surprised at the greater production with less cost that this new chuck can give you. If you are one of the few who have yet to experience the tremendously increased output that comes from using Robertson abrasive products, then you owe it to yourself to investigate the possibilities which this new combination offers you. Let a Robertson engineer show you—right in your own plant—on your own equipment. Write on your business letterhead for a demonstration.

Today, some of the country's largest manufacturers are using Robertson Wheels and Robertson engineering services.

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

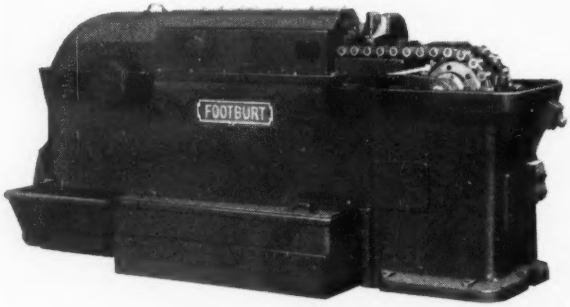
Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

Continuous **broaching of multiple parts**

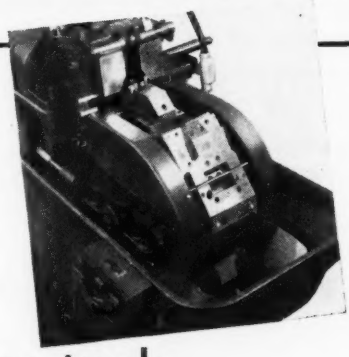
● Wherever metal is removed on duplicate small parts you are apt to find a place where Footburt Surface Broaching Machines can cut manufacturing costs. Production is high, and tool maintenance is low in cost per piece. We have had many years of experience in designing the tooling for various types of parts and will gladly advise you in applying surface broaching to your work.

THE FOOTE-BURT COMPANY · Cleveland 8, Ohio

Detroit Office: General Motors Building



Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.



FOOTBURT machine tools

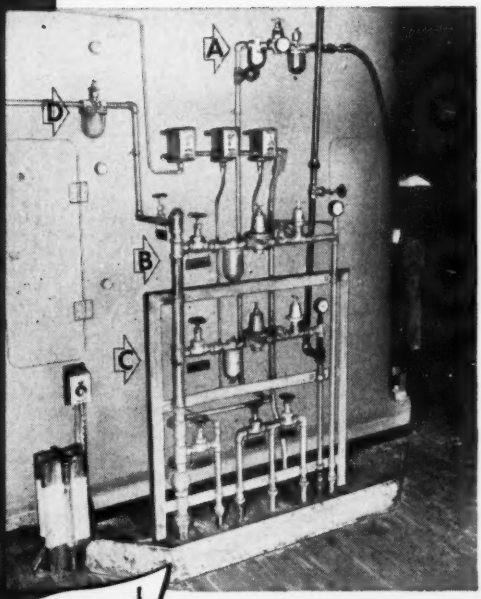
. . . a time tested line of machine tools

tandardizes

ON *Norgren* FOR AIR-CONTROL PANELS ON ALL LARGE PRESSES.

Standard for...

- **easier servicing**
- **minimum spare parts stock**
- **uniform, efficient performance**

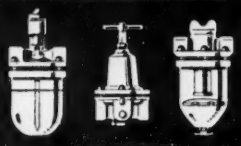


Here is a planned "package" in air controls—a tip for the press builders and press users alike. (A) Norgren Lubro-Control unit serving the "iron hand" which automatically pulls stampings from the press...(B) Norgren Filter, Regulator and Relief Valve serve counter-balance cylinder, (C) Norgren Filter, Regulator, and Relief Valve serve pressure cylinder, (D) Norgren Lubricator serves air tools, such as die-grinders, etc.

Panel is standard on single action, double and triple action presses—capacities from 600 tons to 900 tons.

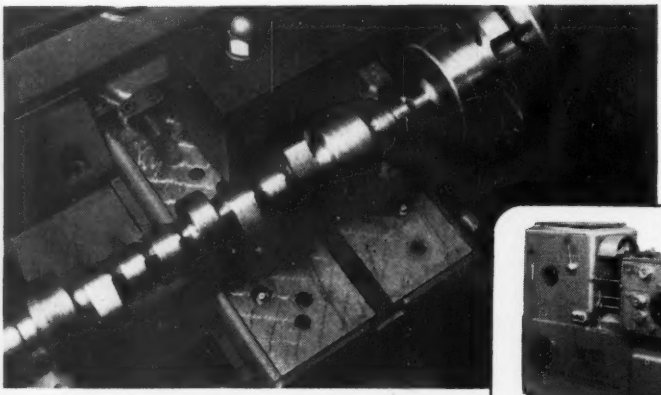
25th Year of Progress

Norgren



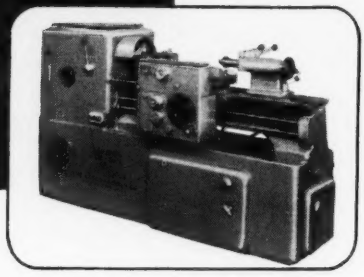
Lubricators, Regulators, Filters, Relief Valves, Check Valves, Air Governors, Needle Valves, Hose Assemblies and Couplings.

A Real THREADING CHAMPION!



Threading Time 20 Seconds

Material
Elec. Furnace Iron
1" Dia. 14P 1300 RPM
Tool Carbide



A tough, production threading job LICKED, EASILY!

THIS CAMSHAFT is loaded into rough locators . . . an air-actuated tailstock picks it up, locates it on a spring-backed work center, and firmly seats it against knife-edge drivers. In 20 Seconds the carbide tool completes the thread. The camshaft is then dropped back to the locators ready for unloading. Cri-Dan Single Point Threading can lick your threading jobs too!

Contact your Lees-Bradner representative or write direct to

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

Just 45 Seconds to Flatten a Flat Iron

...with

PORTER-CABLE Abrasive Belt Machining

Aluminum sole plate for flat iron machined flat—and finish-ground—in one free-hand operation on Porter-Cable BG-8 Wet-Dry Belt Surfacer. No fixtures necessary. Time per piece: 45 seconds.

Porter-Cable Abrasive Belt Machines speed production on all these operations . . .

Machines Flats
Grinds Contours
Generates Radii
Does Centerless Grinding
Chamfers and Bevels
Burrs, Polishes
Smooths Parting Lines

A Complete Line

Platen Grinders

Contour Grinders

Centerless Grinders

Free-Belt Grinders

Contact Grinders

Bench Grinders

ABRASIVE BELT MACHINES drastically reduce surfacing time—often do milling, shaping and grinding operations 10 times faster—save 75 to 90% set-up time.

Stock is removed and the final finish obtained *in one operation.* Jigs and fixtures are simpler, less costly, or eliminated entirely. The wet belt prevents distortion, discoloring, fracturing, chipping. Mail coupon for more information—learn the many applications which will save time and greatly speed-up your production.

PORTER-CABLE MACHINE CO.
5067 N. Salina St., Syracuse 8, N. Y.
Please send me copy of your folder, "Abrasive Belt Machining."
Name.....
Firm Name.....
Address.....
City..... State.....

...rs. of SPEEDMATIC and GUILD ELECTRIC TOOLS
In Canada write: Strongridge, Ltd.
St. Catharines, Ont.

Want to reduce your TAP BILL 50%? 59%? — even 75%?

BLAKE TAP SHARPENING EQUIPMENT DOES THIS FOR OTHERS

No. 4 in a continuing study of Tap performance records made by users of Blake Tap Sharpening Equipment.

TAP PERFORMANCE

Before Sharpening Tapping to Class No. 3 fit a 7/16-27 L.H. thread in brass-3/16" deep blind hole. Operation performed on automatic screw machine with average standard 3 flute commercial Grd. tap. No. of holes: 3000.

After Sharpening on Blake Equipment Tap reground with plus 5° hook in flutes increases average holes *per grind* to 18,000 — an increase of over 600% *per grind*. Average six grinds per tap before it is discarded as too small or too short in thread length. Total holes per tap — 108,000.

Why Not You!

To get dollar-for-dollar value from your taps, you *must* sharpen them just as you do other cutting tools. The Blake Flute Grinder and the Blake Chamfer Grinder provide you with fast, accurate, and economical means for grinding straight flutes, spiral points, and the chamfered ends of your taps — a sure means of reducing your tap bill. Investigate today.

Ask for Bulletins 549 and 649

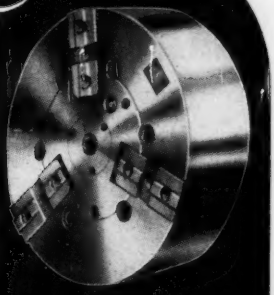
EDWARD BLAKE COMPANY

Black Diamond Precision Drill Grinders . . . Waltham Cutter Sharpeners . . . Waltham Thread Milling Machines . . . Surface Finish Standards.

438 CHERRY ST., WEST NEWTON 65, MASS.

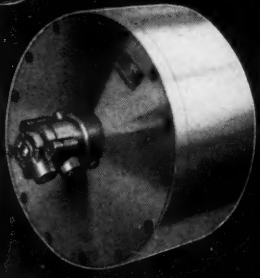
SKINNER POWER CHUCKS

Skinner has a complete line of models for heavy duty production work on engine and turret lathes and automatic machines. Sizes from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws are available. The wedge angle is such that work is gripped positively, either internally or externally, regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates draw bar.



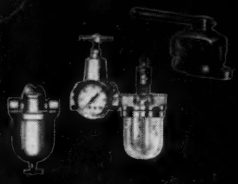
SKINNER AIR CYLINDERS

Skinner double acting rotating or non-rotating air cylinders, for operating power chucks and fixtures, use a minimum amount of air. Large air ports give quick piston movement. Bronze piston packing spacer reduces friction and insures piston alignment and support. All packings are adjusted automatically by the pressure of the air against the flanges of the packings. Available for 6" to 21" dia. power chucks.



SKINNER ACCESSORIES

Skinner power chucking accessories include: hand operating valve which is self-sealing and easy operating regardless of position — complete air unit including regulating valve, pressure gage and lubricator—filter to remove all impurities, scale, etc. from the air line — soft blank top jaws — draw bars — draw tubes, etc.



Write for catalog giving complete details on the Skinner line of power and manually operated chucks.

Sold by leading distributors in every industrial area

THE

SKINNER

CHUCK CO.

340 Church Street, New Britain, Conn.

SKINNER CHUCKS

"THE CREST OF QUALITY"

SAVE TIME—SAVE MONEY WITH famco (COST CUTTING) machines

ARBOR PRESSES

In 32 stock plain lever, simple ratchet, combination compound and simple ratchet models, bench and floor types. Deliver up to 15 tons pressure.

DRILL PRESSES

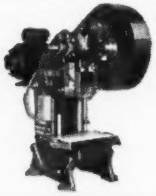
Best buy in 15" drill presses. Complete line of single and multiple spindle models, bench and floor types. Many exclusive Famco features.

FOOT PRESSES

In 10 bench and floor type models of sturdy, semi-steel construction, accurately machined for trouble-free operation. Deliver up to 3¾ tons pressure.

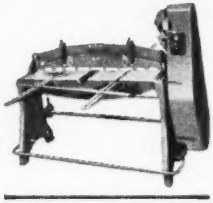
POWER PRESSES

Open-back, inclinable, bench and floor type. Heavy semi-steel, cast iron frame and drop-forged, one-piece crankshafts. Most models; highest quality in small presses.



SQUARING SHEARS

In 3 power and 5 foot models. Cutting widths 22" to 52". Capacity up to 18 gauge mild steel. Inexpensive, ruggedly built, many features.



METAL CUT-OFF BAND SAWS

High quality machine tool made in both dry and wet cutting models. Capacity up to 6" round and 6" x 12" rectangular stock. Many exclusive Famco features.

Designed for time-saving jobs . . . built for long-lasting performance and maintenance economy, Famco machines have earned the reputation of being the finest quality tools for the price. They are a development of nearly a quarter century of design and manufacturing experience . . . incorporate exclusive features not found on any other make regardless of price, and many found only in more expensive lines. The complete Famco Line is available through industrial equipment distributors everywhere.

FAMCO CATALOGS GIVE FULL DETAILS

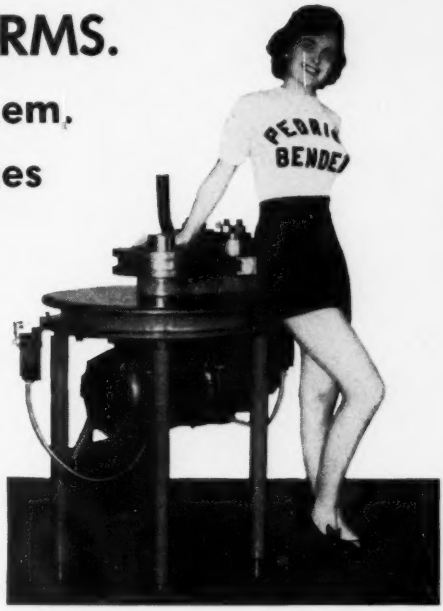
We invite you to check your needs against the Famco Line, shown above, then write for catalogs on the products in which you are interested. There is no obligation.

FAMCO MACHINE COMPANY

SALES DEPT. 1324 18TH STREET • RACINE, WISCONSIN

PERFECT FORMS.

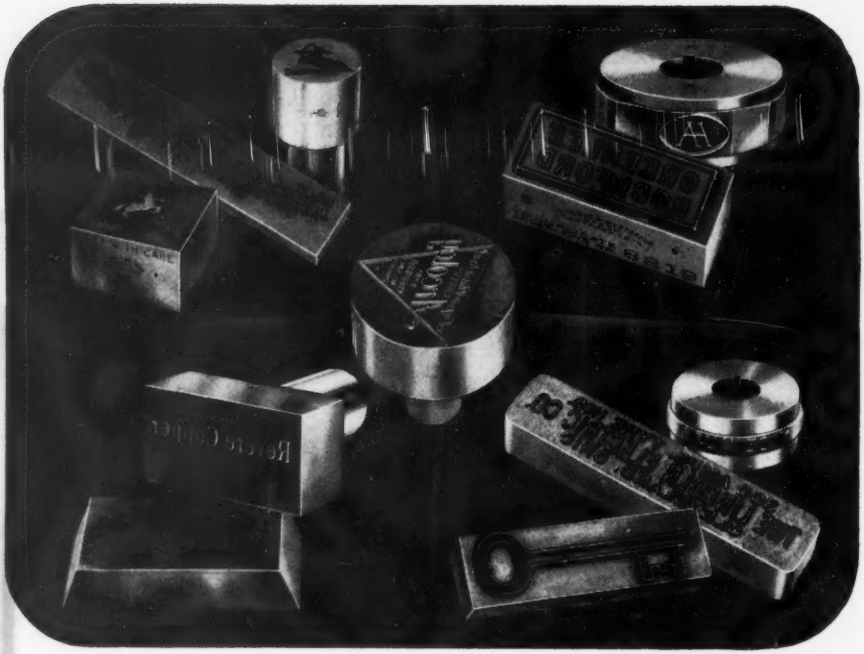
The Girl has them.
Pedrick Machines
make them.



- Pedrick Production Benders will bend pipes, tubes, strips, shapes and bar stock, individually or in mass production. Since the machine is very inexpensive, the cost per piece is very low. If you want to produce quality bending at the lowest possible cost, it will pay you to investigate Pedrick Production Benders.

Write for descriptive folder.

PEDRICK TOOL and MACHINE CO.
3641 N. LAWRENCE STREET **PHILADELPHIA 40, PA.**



NOBLEWEST PRECISION MARKING DIES

for

MARKING
GRADUATING
NUMBERING
KNURLING
EMBOSSING
DEBOSSING

Noblewest makes dies for marking practically every type of surface, including round, flat, concave, convex and irregular contours. Noblewest dies are the finest that human skill and modern facilities can produce—*yet they are competitively priced.* Noblewest uses only specially selected steel, precision engraved to extremely close tolerances, and heat treated for extra long wear. Every Noblewest die is rigidly inspected and Rockwell tested for hardness. Large facilities permit prompt delivery. Send detailed specifications and we will gladly submit quotations. The Noble & Westbrook Mfg. Co., 25 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH

NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

Better check into this tool!

DUMORE DRILL HEAD GIVES 97% COST REDUCTION ON TOUGH JOB

"Saving on first 4½ hours production on this one operation, repaid the cost of the drill head," says Harold Forsmark, Chief Engineer of Stiger Precision Products, Inc., Cicero, Illinois.

OLD WAY — $.385 per piece

Problem was to drill 2 tie-wire holes at an angle thru 1"x1"x½" stainless steel nut of 15 - 20 Rockwell hardness with a No. 50 drill. Maximum production with hand-fed press was 10 pieces an hour and operator broke from 14 - 18 drills per day at a cost of 20c per drill.

DUMORE WAY — $.0117 per piece

With the Dumore Drill Head, Stiger gets 120 pieces an hour and has eliminated drill breakage and scrap loss. Says Forsmark, "We set the pressure and the compressed air chamber of the Dumore Drill Head controls it automatically and changes feed and speed to match the material. This means the drill head 'walks' right down."

If you're using No. 80 to ⅛" drills, it will pay you to get the facts on the New Dumore Automatic Drill Head. Call your Dumore Distributor today for a demonstration. Free 16-page bulletin on request.

DDH-5

THE DUMORE COMPANY
Dept. G-33, Racine, Wis.
Export Address: 13 East 40th Street
New York 16, N. Y., U.S.A.

Tool-post Grinders | Handgrinders | Router | High-Speed Drill Press | Quills | Flexible Shaft Tools

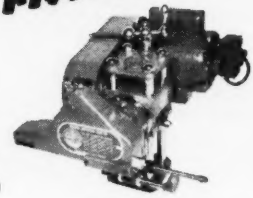
NEW MASTER MILLING ATTACHMENTS

MODELS—FEATURES

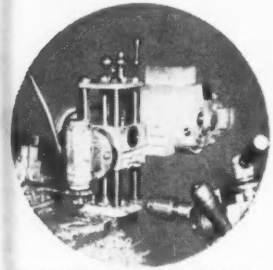
FOR PRODUCTION—TOOL ROOM—EXPERIMENTAL AND MAINTENANCE SHOPS

MILLING ON LATHE—Model "M" 1½ h. p. milling ½" keyway one foot per minute.

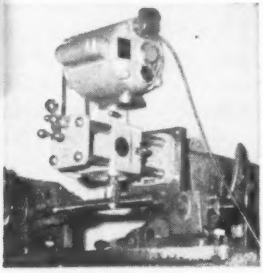
ON LATHES TURRETS AND MILLING MACHINES



Master Universal Slotting and Keyseating Head



MILLING ON TURRET—Model "B" with 90° milling head mounted on rear cross-slide for keyways, slots, cross milling—completing part in turret.



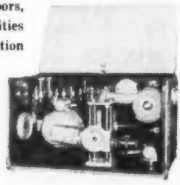
ON MILL—One or two milling heads can be used on post assembly for single or multiple milling cuts. Mounts on overarm for vertical milling or cross-ways for opposed milling head.

3 SIZES • CAPACITIES

Model "C"—⅓ h. p. motor—9" to 13" swing lathes
Model "B"—½ or ¾ h. p. motor—14" to 18" swing lathes
Model "M"—1 or 1½ h. p. motor—18" to 72" swing lathes

The Master Lathe Converter is a precision multi-purpose machine tool attachment adaptable on most all basic shop machines. The basic unit does milling, drilling, boring, and has eight interchangeable heads for milling, drilling, grinding, slotting, keyseating, and indexing. Spindle speeds, 50 to 15,000 rpm. It provides complete machining facilities with minimum equipment investment, produces more operations per set-up thus increasing production of your present equipment, saves work transfer, assures accuracy, is simple and fast to set up. Prime and subcontractors are converting their present equipment for special applications and production with the multi-purpose Master Lathe Converter.

COMPLETE SHOP KIT—**This group of equipment includes basic milling unit, external and internal grinding heads, 90° universal and hi-speed milling heads, slotting or internal keyseating head, 40 to 1 geared dividing head, seven arbors, in a heavy plywood shop cabinet. This kit provides facilities for most all machine shop operations on a lathe at a fraction of the investment required for individual machines, plus wide use on other basic shop machines. Ideal for maintenance and repair, tool room, experimental, mobile units, aboard ships, and production shops.**

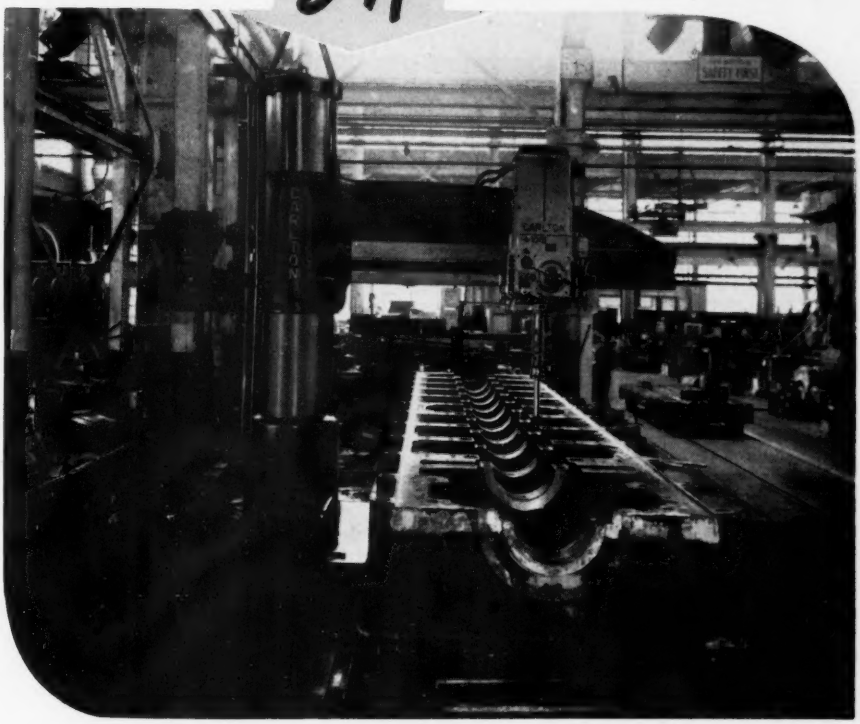


★ MILLING ★ DRILLING ★ BORING
★ THREAD MILLING ★ GRINDING
★ SLOTTING ★ INDEXING
★ INTERNAL KEYSEATING

WRITE FOR FREE LITERATURE

MASTER MANUFACTURING CO.
1302 EAST AVENUE A
HUTCHINSON, KANSAS U. S. A.

CARLTON 5-A RADIAL DRILL



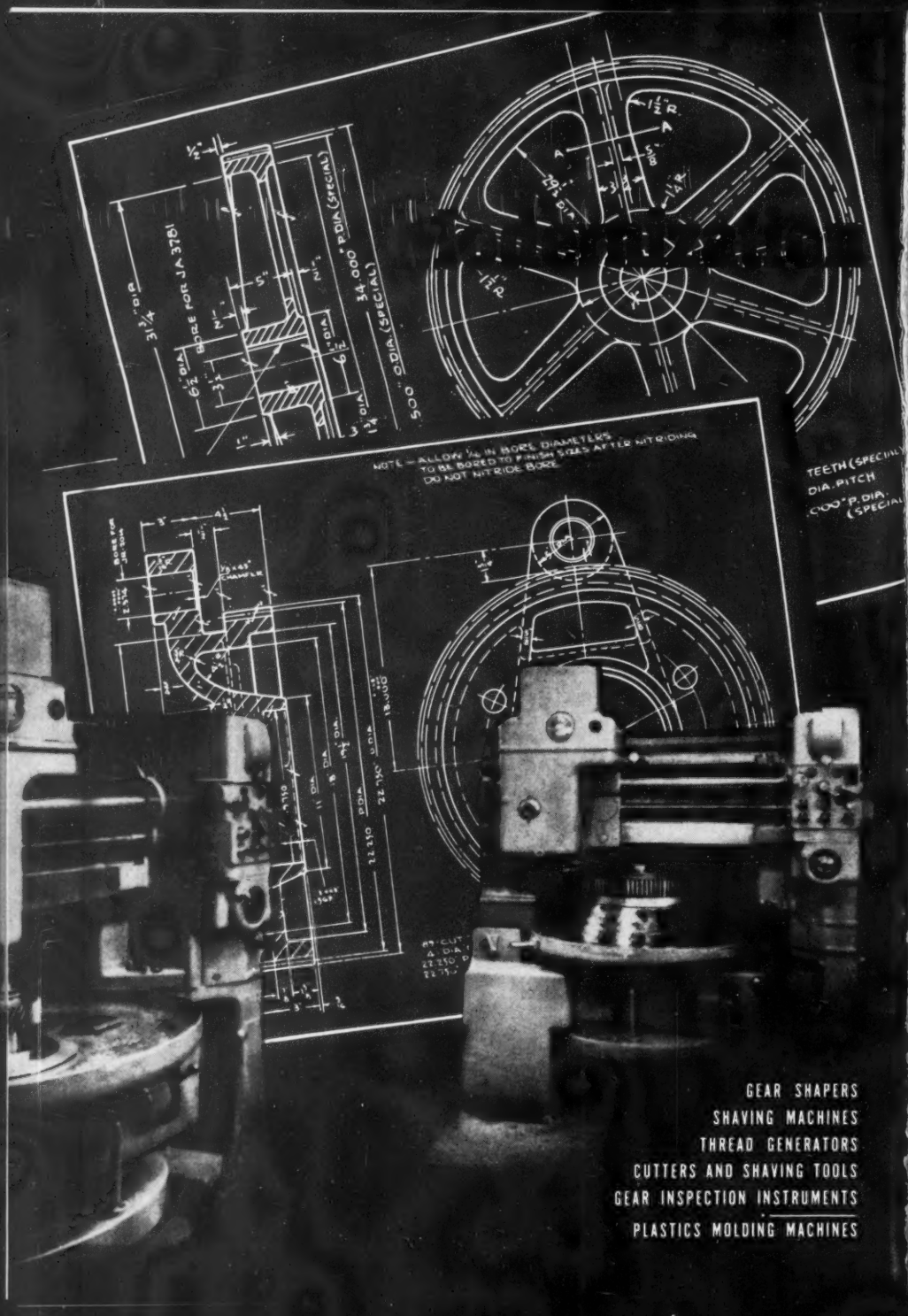
speeds Diesel Engine Production

This husky Carlton 5-A Radial drill, with track-type base, quickly drills and bores bulky jobs that extend over large areas like this 9-cylinder 3600-hp Nordberg diesel engine bedplate. This arrangement offers peak efficiency since one machine can handle the entire job.

The Carlton 5-A is also available with a stationary base and offers the maximum in modern control plus easy, fast, cost-cutting operation. For the "hole" story on Carlton radials, send today for descriptive bulletins.

THE CARLTON MACHINE TOOL CO.
CINCINNATI 25, OHIO

THE CARLTON MACHINE TOOL CO.


NOTE – ALLOW ¼ IN BORE DIAMETERS TO BE BORED TO FINISH SIZES AFTER NITRIDING DO NOT NITRIDE BORE
GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES

Pays Off!

36-Type Gear Shaper Produces in 1/3 the Time

Today's demand for quiet, accurate operation must raise the sights of all producers of gears and component gear parts. To meet precision limits in large diameter coarse-pitch gears, modern production equipment such as the all-purpose 36-Type Fellows Gear Shaper, is required.

Recently, one manufacturer replaced 5 outmoded machines with two (2) 36-Type Gear Shapers. The result—better, more accurate gears and, most important, a substantial boost in overall production.

Cost saving is obvious (as shown in the time-performance chart at right) as the result of ability to take heavy cuts at high speed and hold to close limits. Greater flexibility for handling a variety of work is present, along with improved ease of set-up, operation, and 'Change-over'.

If you've a job of precision gear manufacture up to 36" pitch diameter where cost economy and quality of output is important...a thorough investigation of the Fellows 36-Type Gear Shaper is worthwhile. Simply contact the nearest Fellows Office.

Production Performance

LARGE BRONZE GEAR (Top)

Material	High tensile bronze #3
Face width	4 inches
Pitch diameter	34.000 inches
No. of teeth	138
Diametral pitch	4
Former Production Time	6 hours
vs.	
Production Time on 36-Type Gear Shaper	**1 hr., 55 min.**

STEEL SPUR GEAR

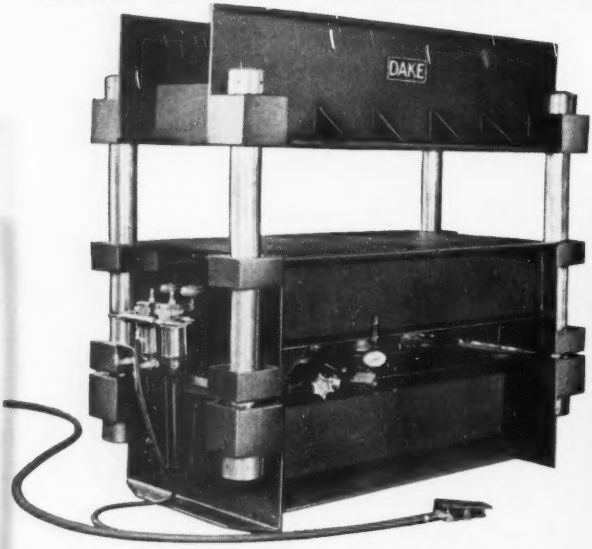
Material	Steel casting DW-19
Face width	3 inches
Pitch diameter	22.250 inches
No. of teeth	89
Diametral pitch	4
Former Production Time	10 hours
vs.	
Production Time on 36-Type Gear Shaper	**2½ hours**

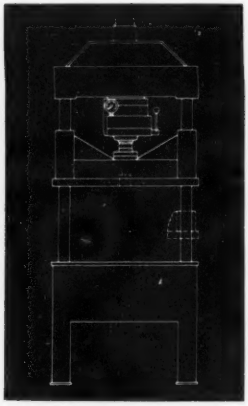
PHOTOS AND PRODUCTION DATA COURTESY SAMUEL M. LANGSTON COMPANY, CAMDEN, NEW JERSEY.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

MATCH DIES *in the toolroom*





DAKE Die Try-Out Press saves tying up production equipment

The photograph above shows a specially engineered, custom-built DAKE Die Try-Out Press of 125-ton capacity. Its guided platens assure uniform alignment in testing, enabling diemakers to match dies perfectly before they leave the toolroom.

This press was designed with an air-operated hydraulic cylinder and single-acting piston in the base. At the end of the upward stroke the release valve is opened, permitting the platen to descend by gravity.

The drawing illustrates another DAKE Die Try-Out Press—a 50-ton model with hydraulic workhead above the upper platen. The ram is powered on both up and down strokes.

Either of these presses may also be used for sample or short-run production. If you have a problem which requires development of a special press, it will pay you to communicate with DAKE.

Dake Engine Company, 612 Seventh St., Grand Haven, Mich.

DAKE
arbor and hydraulic
PRESSES

Single Leverage

Compound Leverage

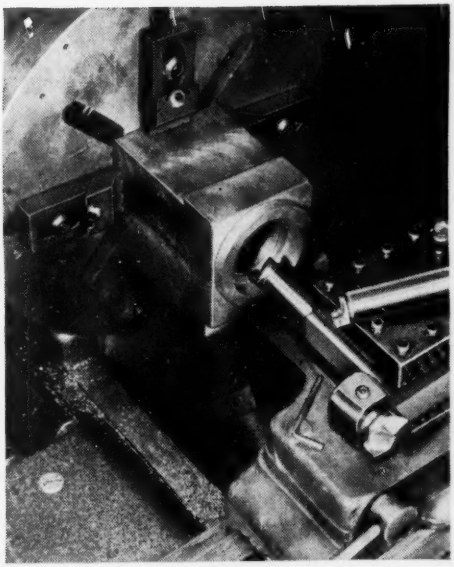
Hand-Operated Hydraulic

Air-Operated Hydraulic

Elec-Draulic

SLASH SET-UP TIME

with J&S KOALA *CIRCULAR* CUTTING TOOLS



WITH these J & S Time Savers—available in carbide or high speed steel, at reasonable prices — each new or re-sharpened cutter can be inserted **without resetting** machine or stops in any way! This is possible because each cutter accurately **repeats** the original set-up position when it is inserted into the shank. Removing and inserting is quick and simple. Different types of cutters can be used in the same shank. J & S KOALA TOOLS are **easy** to re-grind with any desired rake. Cutters may be re-ground without a jig. It is *not* necessary to re-grind any predetermined amount off the rake surface. With KOALA TOOLS, the *same* tool can be used for turning and facing—the *same* shank may be used for forming, necking and grooving — and the *same* internal tool can be used for internal facing or boring.

PRINCIPAL USES

Boring Bars: Boring, Facing, Threading, Forming.

External Turning Tools: Turning, Facing, Forming, Threading

Write for Further Information

Photo shows typical deep boring, boring and internal facing operation for bearing seat, and external facing and turning. The 12" J & S KOALA Boring Bar is removed from turret to show carbide head after numerous re-grinds.

SEND FOR BOOKLET, "Machine Shop TIME SAVERS by J & S". Illustrates and explains: J & S "Fluidmotion" Dressers, KOALA Circular Cutting Tools, "Down-Hold" Vise Jaws and "Attachable" Parallels, "All-Purpose" Jaw Clamps, and J & S Form Grinding Service.

J&S TOOL CO. INC.

475 MAIN STREET
EAST ORANGE,
NEW JERSEY

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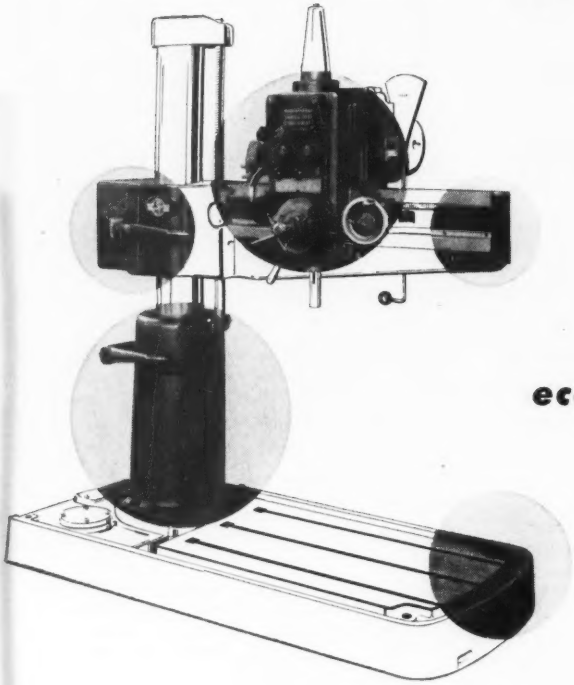
Representatives In Principal Cities

feature-packed



economy priced

The new Canedy-Otto **CINCINNATI ROYAL RADIAL** (3-foot arm, 7-inch column) has the features you need to handle up to 90% of your drilling requirements. It combines low cost with such high-priced radial features as: all-geared head, automatically pressure lubricated, 9 spindle speeds (30 to 1 overall ratio), 6 power feeds, flame hardened transmission gears . . . all shafts mounted on anti-friction bearings . . . ground tubular steel column mounted on two Timken tapered bearings . . . simple, trouble-proof column and arm clamps . . . hardened and ground head rail on arm . . . extra heavy base. Catalog CO-15 on request.

CANEDY-OTTO DIVISION

cincinnati lathe & tool co. CINCINNATI 9, OHIO, U.S.A.

OILITE Finished Machine Parts give you these important advantages:

• QUICK DELIVERY • NO TOOLING PROGRAM • LOW PRICE • RELEASE OF SKILLED MANPOWER • CONSERVATION OF STRATEGIC MATERIALS

ALTERNATE MATERIAL
Oilite gives you a dependable alternate for bronze, brass, aluminum, cast iron, steel, and plastics.

MACHINING ELIMINATED
Oilite processes help you eliminate as many as twenty-four machining operations.

SIMPLE TOOLING
Oilite products require little tooling; saving you floor space, jigs and fixtures, skilled manpower, and time.

UNDUPLICATED EXPERIENCE
Oilite engineers pioneered iron powder metallurgy; their experience of more than twenty years, and Oilite's broad facilities are at your disposal.

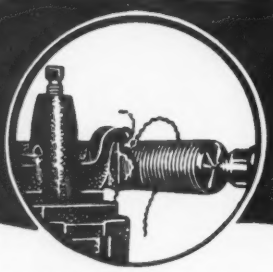
OILITE FERROUS-BASE BEARINGS
Heavy duty, oil-cushion, self-lubricating.
Excellent for replacing your nonferrous units of solid material.

Oilite representatives and field engineers are located throughout the U. S. and Canada. You are invited to contact the field engineer in your district or write the home office.

AMPLEX MANUFACTURING COMPANY
Subsidiary of Chrysler Corporation
DETROIT 31, MICHIGAN

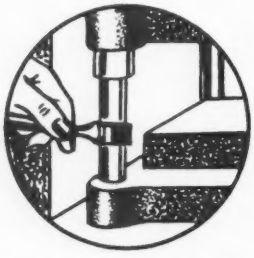
Besides Field Engineers, Supply Depots too, are maintained in Principal U. S. and Canadian Cities.

OILITE
PRODUCTS

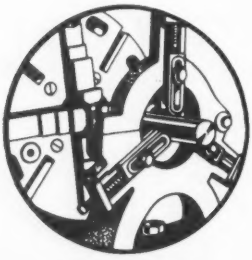


Increase YOUR HOURLY OUTPUT!

On **Lathes** and other machines using centers, CMD LUBRICANTS prevent dangerous seizure, waste and costly delays.



On **Die Set Pins** and **Bushings** CMD LUBRICANTS minimize wear and time-out to re-lubricate.



On **Steady-Rests** CMD LUBRICANTS assure smooth, true turning of work and complete freedom from scoring and seizure.

Lubricate Machines with Longer-Lasting

CMD *Anti-Scoring* LUBRICANTS

For smooth performance and greater man-hour production, protect your machines with CMD Anti-Scoring Lubricants. Because they withstand pressures greater than 50,000 pounds per square inch and will not mulsify with liquid coolants, they protect bearing surfaces better and longer. Illustrated here are just a few of the many applications where CMD Lubricants are cutting costs. But see for yourself. Test CMD Lubricants on your toughest operations.

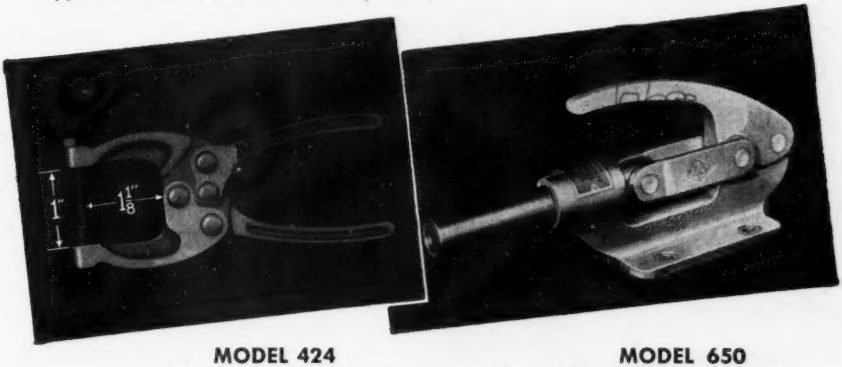
Write for FREE Samples!
Address Dept. 7MM

CHICAGO MANUFACTURING & DISTRIBUTING CO.
1928 W. 46th St. · Chicago 9, Ill.

If you have to HOLD

ANYTHING in your production operations

Hold EVERYTHING with "DE-STA-CO" Toggle Clamps in welding, riveting, bonding, machining and assembly. • Fast clamping, positive holding pressures, instantaneous release—Toggle Clamps speed up your operations and cut your costs. • There are more than 40 different Toggle Clamps manufactured by Detroit Stamping Company in various types and sizes to meet industry's requirements.



MODEL 424
PORTABLE PLIER CLAMP
For one-hand use in cramped work areas and small space. Deep jaw capacity but only 4½" in length.

MODEL 650
HEAVY DUTY PLUNGER CLAMP
For "push-pull" work-holding jobs where considerable pressure is needed. Compact; up to 4000 lbs. capacity.

MODEL 235-U RETRACTABLE CLAMP (Not illustrated)
Quick, unimpeded loading and unloading of fixtures easily possible with this one. Up to 750 lbs. pressure.

Ask for "DE-STA-CO" Toggle Clamp Catalog and name of representative nearest you who is stocking our entire line of Toggle Clamps.

DESTACO **DETROIT STAMPING COMPANY**
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I CAN DO A BIGGER AND BETTER DAY'S WORK ON A

CHALLENGE

WORK BENCH

Four Sizes

28 inches wide x 4, 5, 6 or 7 ft. long. Top 2" thick.

HERE'S WHY: Heavily ribbed, smoothly machined cast-iron top provides a "surface plate" . . . Table equipped with lock-leveling screws . . . Steel shelf in sturdy steel welded base . . . Steel tool box shelf, guard rail, and drawer with lock . . . Vise and individual light can be easily attached . . . Bench is portable. Write for details. 666

THE CHALLENGE MACHINERY CO.

Office, Factories, Show Room

Challenge

Grand Haven, Michigan

HOW TO SAVE TIME AND MONEY IN MAKING TOOLS, PARTS, DIES

use

DoALL

OIL HARDENING

PRECISION GROUND FLAT STOCK

Simply make your layout and you are ready to machine

IMMEDIATE DELIVERY FROM STOCK

GREATEST SELECTION AVAILABLE ANYWHERE!

OVER 200 SIZES

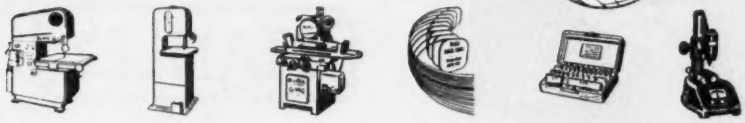
CONTROLLED ANALYSIS

DoALL *precision ground* flat stock eliminates costly machining of stock to size, assures you of accuracy, fine finish and no shrinkage. ASK FOR BULLETINS AND FLAT STOCK CHART SHOWING OVER 200 STANDARD SIZES.

CALL DoALL TODAY . . .

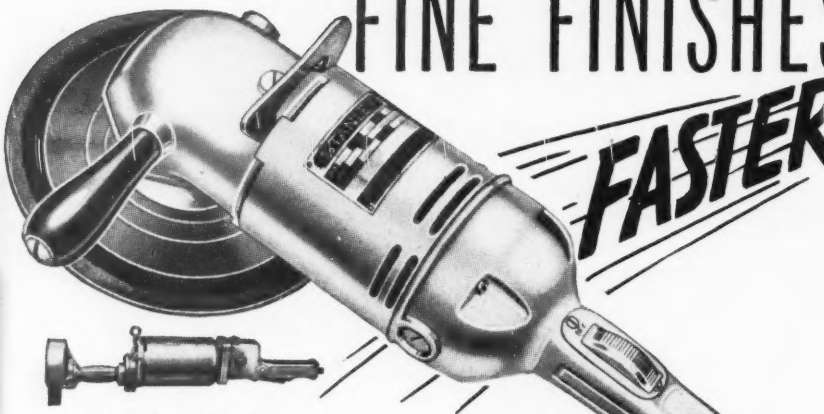
there are twenty-seven DoALL Sales Service Stores in principal cities serving the entire country

The DoALL Company
254 N. Laurel Ave.
DES PLAINES, ILLINOIS

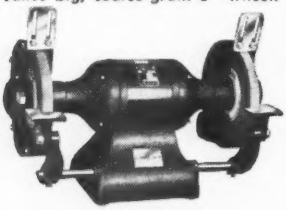


CONTOUR SAWING MACHINES • SURFACE GRINDERS • GAGES • CUTTING TOOLS & INDUSTRIAL SUPPLIES

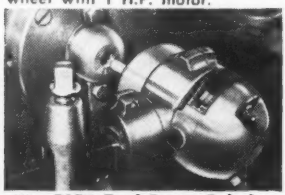
FINE FINISHES FASTER



No. 566 Portable Grinder
For the heaviest portable grinding. Takes big, coarse-grain 6" wheel.



No. 610 Bench or Pedestal Grinder
Powerful, highest quality. Uses 10" wheel with 1 H.P. motor.



No. 585D Tool Room Grinder
Used on Milling machine or lathe, for external or internal grinding.

No. 153A Portable Grinder
For free-hand grinding, external or internal grinding.

STANLEY
DISC-GRINDERS
No. 72 – 7"
No. 92 – 9"

For heavy loads or light loads, you'll get fine finishes, in less time, with Stanley No. 72, or 92 disc-grinders. They are ideal for smoothing rough castings, grinding heavy welds of cast iron, and polishing metal surfaces.

Heavy-duty features include powerful universal motor, seal-type ball bearings, and spiral bevel gears. Side handle can be used on either side. See the No. 72 and No. 92 at your industrial distributor's. For literature on any of these Stanley Tools, write Stanley Electric Tools, 416 Myrtle St., New Britain, Connecticut.

STANLEY

Reg. U.S. Pat. Off.

HARDWARE • TOOLS
ELECTRIC TOOLS • STEEL STRAPPING • STEEL

Economy ELEVATING Table

For feeding sheet stock, supporting fabricated frames, handling heavy dies, or as a portable work bench. All four sides are accessable to the user.

Lifting and lowering load is hand operated. Crank handle can be attached and operated from either end, with two speed lifting. Self locking worm and screw elevating mechanism holds work at any height without danger of falling. A foot operated floor lock holds table stationery when in use.

This standard designed table has a capacity of 2,000 lbs. Special designs can be built to suit your requirements.

PRICE F.O.B. CHICAGO
. . . . . $310.00
Subject to current discount

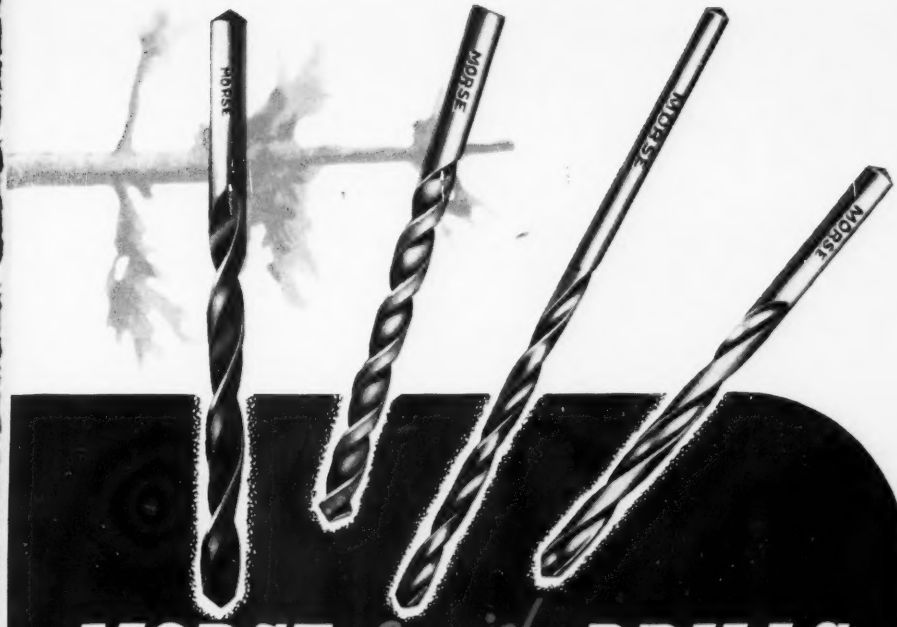
ELEVATING TABLE EXTENDED

LOW POSITION

ECONOMY ENGINEERING CO.
4507 W. Lake St.,
Chicago 24, Illi.

He's a Top Specialist

...and so is each of these



MORSE *Special Purpose* DRILLS

Timber-toppers are tops in their line. And so are all Morse *Special-Purpose* Drills. Take the *Heavy-Duty Drill* that withstands greater point pressures in stainless, spring steel, hard cast iron, monel, and hard-to-work materials. Or the *Bakelite Drill*, specially designed and treated to stand the harsh abrasive action of molded plastics, asbestos, fibre, brass and hard rubber. Try the *Quick Twist Drill* if your job is deep-hole drilling in non-ferrous metals or some plastics. And if you do shallow-hole or skin-metal drilling, the Morse *Cotter Pin Drills* are exactly what you want.

For these and many other highly specialized drilling jobs, Morse has the top-quality drills *especially designed for those jobs.* And these Morse-Quality Drills are available only through your Morse-Franchised Distributor. Get in touch with him today . . . and get extra-special results *and savings.* For even greater production . . . and savings . . . specify Morse Electrolized.

Morse Twist Drill & Machine Company
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, San Francisco

MORSE
Cutting Tools

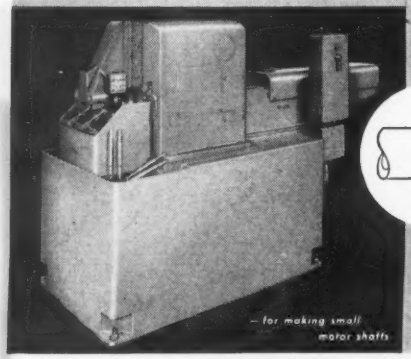
MOTCH & MERRYWEATHER

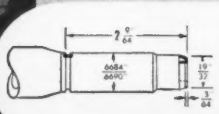
Cam Automatics—

HOPPER LOADING OR BAR FEED

• COMPLETELY AUTOMATIC •

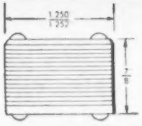
TWO SPINDLES CONTROLLED BY ONE MAIN CAMSHAFT!





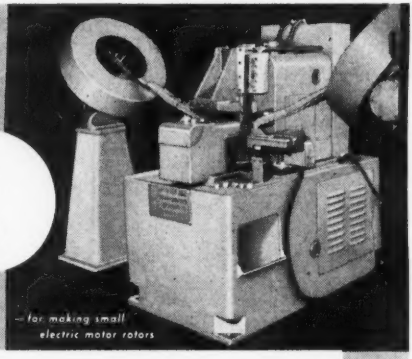
MOTOR SHAFTS

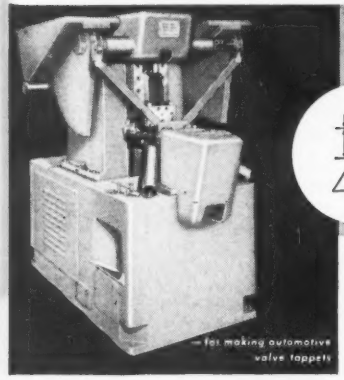
Operation: Turn, neck and chamfer.
Material: Steel tubing.
Production: 1400 pcs/hr. @ 100% efficiency.

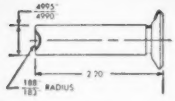


SMALL MOTOR ROTORS

Operation. Turn O. D. and chamfer one end.
Material: Laminated silicon steel.
Production: 800 pcs/hr. @ 100% eff.







VALVE TAPPETS

Operation: Radius, neck and chamfer.
Material: 5120 steel.
Production: 2400 pcs/hr. @ 100% efficiency.

Stock feed, loading and locating mechanisms, collets and feeds of tool slides are controlled mechanically by a single camshaft —*simplicity itself.* M. & M. cam automatics require minimum attention and only occasional checking of work-pieces. If you will submit your drawings and specifications, we will tell you how Motch & Merryweather cam automatics can increase your *production with accuracy.*

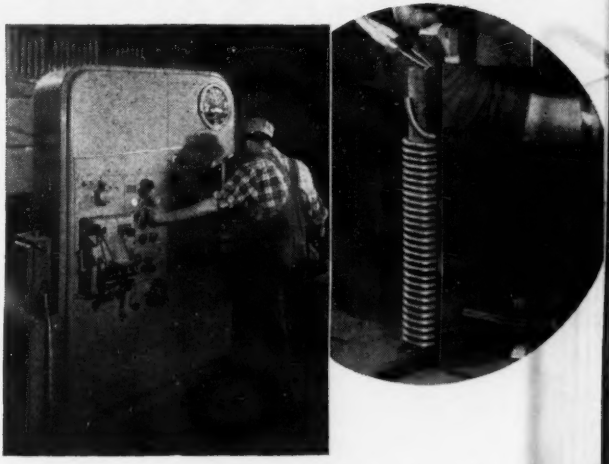
Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

ELIMINATES COSTLY MILLING OPERATION ON SPLIT RINGS

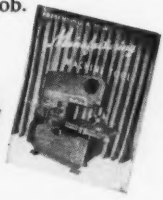
ECONOMICAL DoALL BAND MACHINING DOES JOB IN 1/3 THE TIME, FREES MILLING MACHINE FOR OTHER WORK



BAND MACHINING CAN DO 100's OF JOBS FASTER, AT LOWER COST

DoALL Band Machines cut *continuously* — they slice the material apart, instead of reducing it to a pile of chips. They are fast, they are versatile, they are easy to use. There are DoALL Band Tools for every cutting, filing, grinding, honing and polishing job.

SEND FOR CATALOG



Learn about the complete machining facilities offered by this modern band machine.

ASK Gates City Iron Works, Omaha, Nebraska, about the DoALL Contour-matic Band Machine! They were cutting split rings from ¼" cold rolled steel coils on an expensive milling machine. A DoALL MP-20 slashed time for the job by two-thirds and released the milling machine for other work.

In this same plant the MP-20 used for friction sawing of thin stainless cut the operation time in half.

You can cut anything with a DoALL MP-20 Contour-matic — any material, any shape. Ask to have a *demonstration* of this versatile, time, money and material-saving machine tool right in your own plant. A DoALL sales service engineer will bring it to you, *show you* what it can do. Call your local DoALL Sales-Service Store or write:

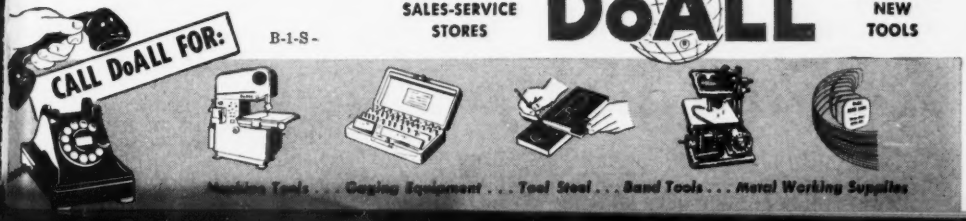
THE DoALL COMPANY • 254 N. Laurel Ave. • Des Plaines, Ill.

27 SALES-SERVICE STORES

DoALL

INDUSTRY'S NEW TOOLS

B-1-S-



Here's PREPAREDNESS of the Soundest Kind

3 Brown & Sharpe Machines

that equip you to mill small and medium-sized parts fast, accurately, economically

The greatest service you can render to your company today, is to make sure that your plant facilities are prepared to meet increasing demands for accurately-made small and medium-sized parts at low cost.

That is why it will pay you to investigate the three manufacturing-type Brown & Sharpe Milling Machines shown here. They are specifically designed for mass producing milled parts, with uniformly high precision and minimum demand on the operator's time and attention. Adapted to an almost endless variety of jobs, they assure you continuing big returns on a moderate capital investment. Write for detailed catalog and specifications. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

No. 12 PLAIN MILLING MACHINE
3 h.p. Spindle Drive

Complete electrical control of all power movements gives unusually precise, smooth performance with outstanding ease and flexibility. Wide variety of automatic cycles obtainable, with time-saving dual feed rate. Ample capacity for majority of medium-sized work. Climb milling in either direction.

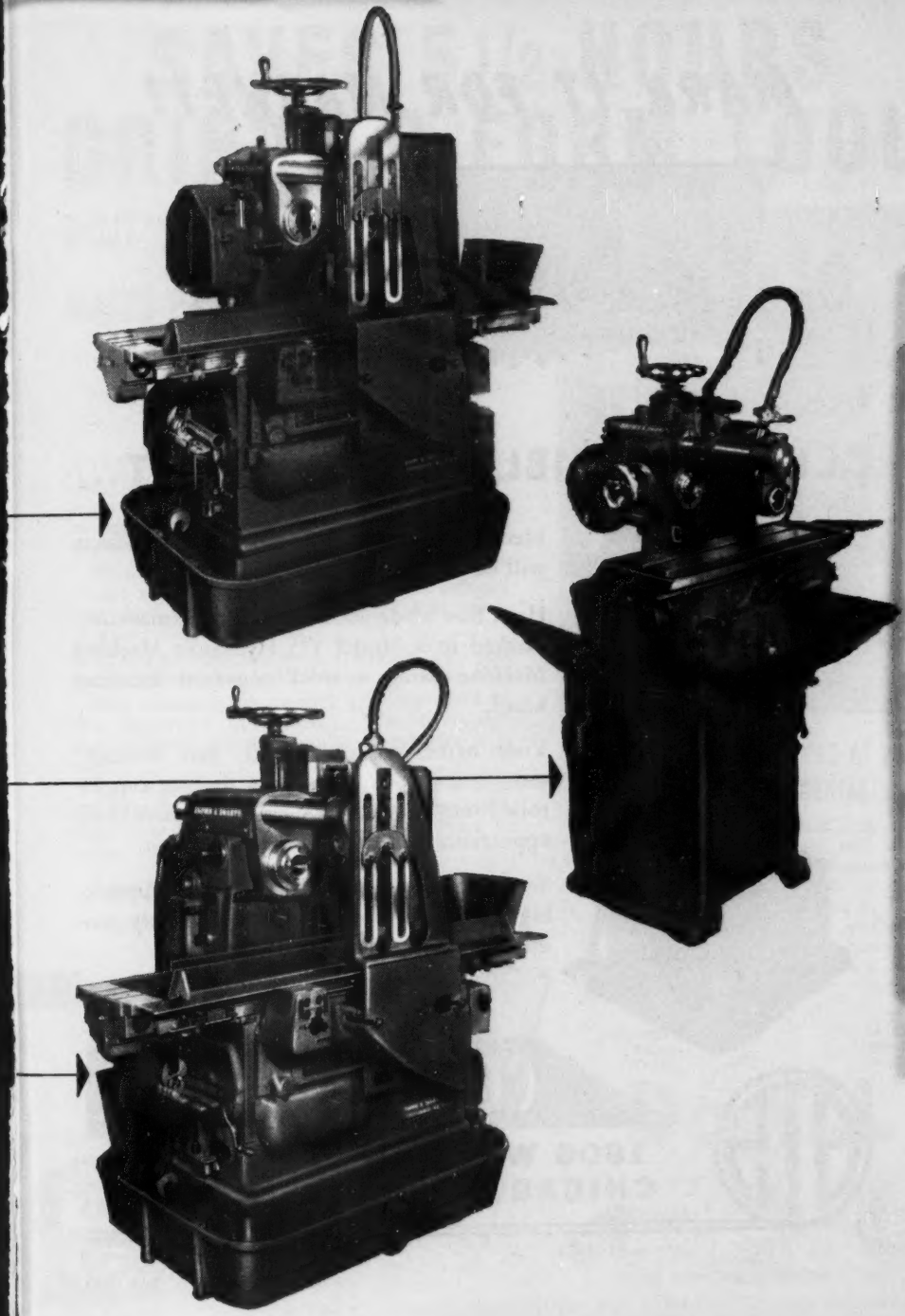
No. 000 PLAIN MILLING MACHINE
½ h.p. Spindle Drive

For economical, fast production of small pieces such as parts for firearms, radios, etc. Automatic cycle and minimum fatigue for operator afford uniform production rate. Uniform feed gives long cutter life.

No. 12 PLAIN MILLING MACHINE
7½ h.p. Spindle Drive

Same features and advantages as the 3 h.p. model, but powered for heavier cuts, including many moderate-sized carbide milling jobs.

Brown & Sharpe B·S



MARK IT FOR MARKET!

CLEAN...LEGIBLE...PERMANENT...

MODEL
175
HYDRAULIC

Identification ROLLED into your products will help you market them.

Hack Saw blade above has been permanently marked in a Model 175 Hydraulic Marking Machine using a solid engraved lettering knurl.

Your name, model number, part number, serial number or decorative designs can be rolled into your components to improve their appearance and facilitate identification.

Send prints of parts, showing required marking and its location on part with hourly production for free recommendation.

WRITE FOR CATALOG

GTS

GEO. T. SCHMIDT, INC.

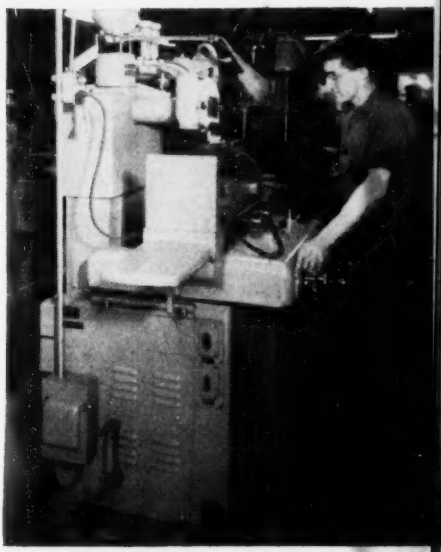
1806 W. BELLE PLAINE AVE.
CHICAGO • 13 • ILLINOIS

SAVES 5 1/2 HOURS GRINDING FORM TOOL

DoALL "COOL-GRINDING" PRINCIPLE

(U. S. PATENT NO. 2470350)

MAKES POSSIBLE FASTER WORK, GIVES STRAIGHTER CUT, PREVENTS WARPING



TAKE a tip from Biddle Screw Products, Sheridan, Indiana. The carbide bar in one of their large screw machines would warp under normal cutting conditions. The cut was taking 3/4 of a day and the piece wasn't always satisfactory.

Then they turned to DoALL *"Cool-Grinding"* of the carbide bar. The coolant flows *through* the wheel and atomizes at the point of work. *Standard wheels are used.*

RESULTS? No warping, a straight cut, perfect pieces—*and only 30 minutes to do the job!*

You wouldn't believe tool grinding could be that important, but DoALL *"Cool-Grinding" does* produce *amazing* results everywhere it is used.

SEE FOR YOURSELF. Ask to have a Free DEMONSTRATION right in your own plant. Call your local DoALL Sales-Service Store or write:

THE DoALL COMPANY
254 N. Laurel Ave., Des Plaines, Ill.

"COOL-GRINDING" COOLS AT POINT OF CONTACT...

Coolant is metered into the hub of the wheel, forced centrifugally through the pores and out in a fine mist *at the point of contact of wheel and work.*

SEND FOR CATALOG TODAY

Lists all models of DoALL Precision Grinders for toolroom and production work.

INDUSTRY'S NEW TOOLS

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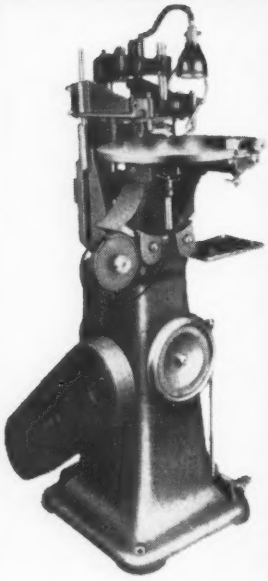
Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

BE WISE, OLIVERIZE



BRING YOUR TOOL ROOM UP-TO-DATE WITH— OLIVER DIE MAKING MACHINES

Time and dollars are of utmost importance — you'll save both by using Oliver Die Making Machines — producing more accurate dies. Oliver Die Making Machines perform sawing, filing and lapping operations with great speed — effecting savings up to 60%. The cost-cutting Oliver Way is daily increasing efficiency and lowering costs for Oliver Users (many of them for more than 25 years) . . . like them, BE WISE, OLIVERize your tool room.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today for Complete Technical Data.

OLIVER INSTRUMENT CO.

1430 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

SEND FOR
FREE CIRCULARS.

MATTISON

HIGH-POWERED PRECISION SURFACE GRINDERS

• Rugged, High Powered and Versatile, Mattison Precision Surface Grinders with double-column construction are built to handle your grinding jobs on a real production basis, providing repeated precision results and a fine finish.

They are built with table sizes from 12" to 36" wide by 36" to 192" long.

WIDE ABRASIVE-BELT GRINDING and POLISHING MACHINE

• From the time factory coated abrasives were introduced for metal polishing and grinding, Mattisons have developed and built machines properly applying belts to do the job to be done. The Wide-Belt Sheet Grinder and Polisher shown above is for finishing stainless steel and alloy sheets in sizes up to six feet wide and sixteen feet long.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

FULL SPEED AHEAD

IS THE PRESENT-DAY DEMAND

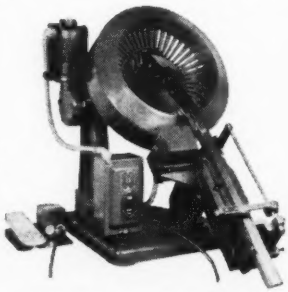
and You Can Command It With

D.P.S. MOTORIZED
Selective Feeding
HOPPER UNITS

Hopper feeding 30 caliber shell discs, concave side up, to press for drawing operations.

Modern production methods demand more speed and accuracy in the selection and feeding of parts than can be accomplished by hand . . . Our 25 years experience as pioneers in the assembly field enables us to ably meet this demand with the D.P.S. Motorized Hopper Units, the outstanding selective feeding devices with which production parts of a wide variety are selected, oriented and fed in a given position for primary and secondary operations . . . They are a completely self-contained unit, including drive and feed track. They are easily adaptable to presses, centerless grinders, thread rolling and slotting machines, also special machines... Six sizes, 8", 10", 12", 16", 24" and 30" diameters for handling various sizes of parts. No matter what your feeding problem is, we can meet your requirements. Designers of special equipment will also be interested.

Sixteen-inch hopper mounted on tapping machine equipped with air-operated dial—completely automatic operation.



Counting and feeding hopper with adjustable escapement to accommodate varying quantities.

Send for further details, also information about D.P.S. Power Screwdrivers, Nut Drivers and Special Assembling Machines.

DETROIT POWER SCREWDRIVER CO.

2807 W. FORT ST. **DETROIT 16, MICHIGAN**

New!

CP AIR HOIST

with

graduated speed control

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Rotary vane air motor gives smooth starting and a pulsation-free flow of power. Loads are spotted accurately, quickly, gently.

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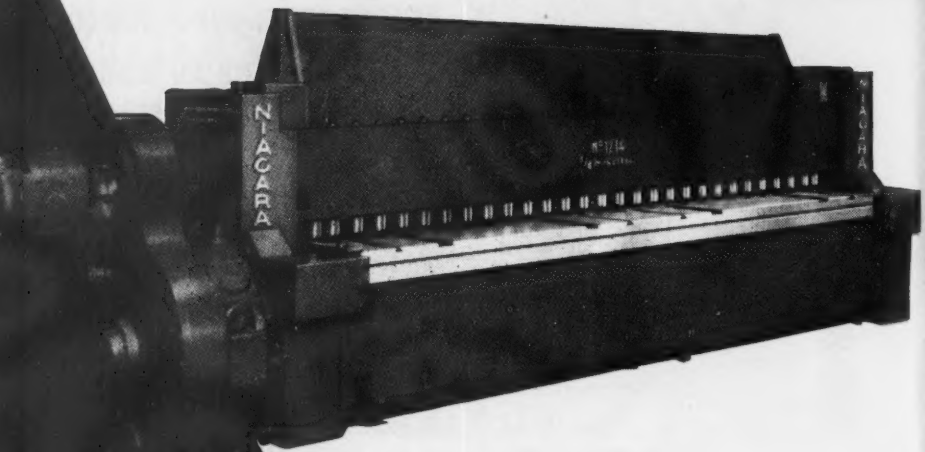

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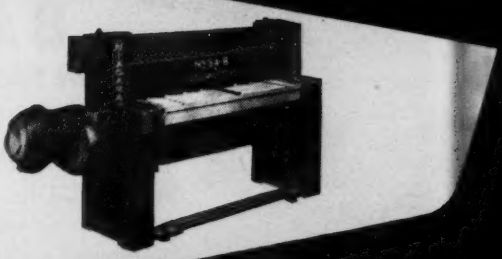

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FEATURES IN THIS ISSUE

MODERN Machine Shop

JULY, 1951

Vol. 24, No. 2

Production Operations on Buda Diesel Truck Engines, Part I — *By J. Broberg*

This story covers some of the interesting machining operations involved in the building of gasoline and diesel engines at the Buda Company plant. Of particular interest are the special machining operations being performed on standard tools. Page 86.

High Strength Fastening — *By Gilbert C. Close*

In this article, Mr. Close describes methods of joining light aluminum alloy structures which in service must withstand the tremendous stresses imposed by supersonic flight speeds. Page 102.

Solar Aircraft Adapts Portable Tools to Production Needs — *By Ward E. Willcutt*

Mr. Willcutt, whose position is that of equipment engineer, tells how his company has increased production and reduced tool cost through the proper application of portable tools. Page 122.

Making a Quality Audit of Manufacturing Operations — *By C. W. Kennedy*

A description of a simple technique for determining exactly what a machine, a process, a department or a shop is capable of producing in terms of quality. Page 132.

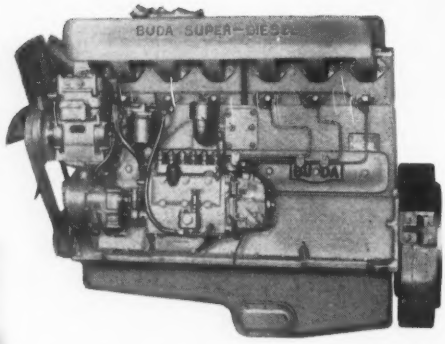
The Right Tool for the Job — *By J. T. Lancaster*

The author describes the construction and application of several time-saving jigs and fixtures. Page 162.

Designing Drawing and Redrawing Dies — *By C. W. Hinman*

In this month's article, Mr. Hinman presents formulas and other helpful data for designing and operating drawing and redrawing dies. Page 190.

Also the regular monthly sections: Modern Equipment at Work, Page 214; Ideas from Readers, Page 242; News of the Industry, Page 258; New Shop Equipment, Page 304; and the valuable "Where to Get It," Page 352.



Comprising a Synthetic Trip Through a Modern Truck Engine Plant

Production Operations On Buda Diesel Truck Engines, Part I

By J. Broberg
Assistant Factory Manager, The Buda Company, Harvey, Illinois

NEXT to production, probably the most important single item in the maintenance of commerce and business is distribution—for which America has come to depend to a large extent upon motor trucks. The importance of the motor trucking industry in our distribution system is indicated by the fact that in 1950 some 8,600,000 trucks were engaged in transporting approximately 115 billion ton-miles of goods and materials.

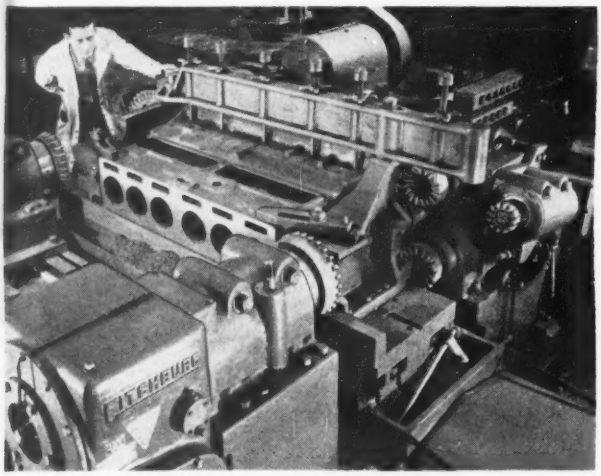


Fig. 1—Rough and Finish Milling the Top and Bottom of a Buda Diesel Engine Cylinder Block

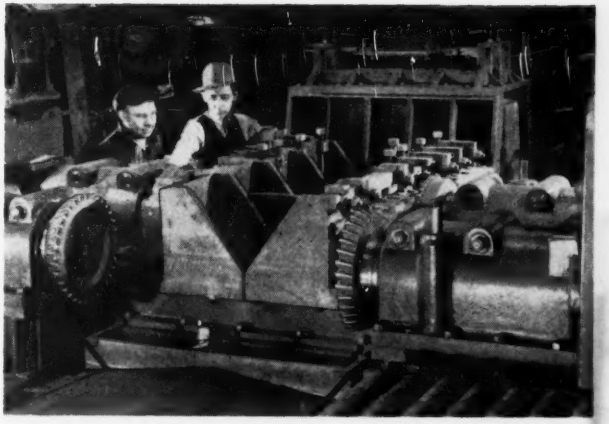


Fig. 2 — Four Cylinder Heads and One Crankcase are Milled Together in This Operation

Obviously the ability to maintain a high quality of service on such a huge scale depends to a very large extent upon the quality and dependability of the individual motor truck power plant. For many years power was derived from gasoline engines, but in more recent years refinements in the design of the Diesel engine have made it possible to adapt the Diesel for truck use, and the use of the Diesel engine for this purpose is steadily increasing.

Among the leading American manufacturers of gasoline and Diesel engines is The Buda Company of Harvey, Illinois, which stands out because of its long history as a producer of industrial equipment, and for the past forty years as a builder of internal combustion engines.

The Buda Company was established in 1881 to manufacture railroad supplies. In 1910, anticipating the potential growth of the automotive industry, The Buda Company entered this field with a line of high-quality gasoline engines for trucks and busses and for agricultural, marine and industrial purposes. In 1926 the company began

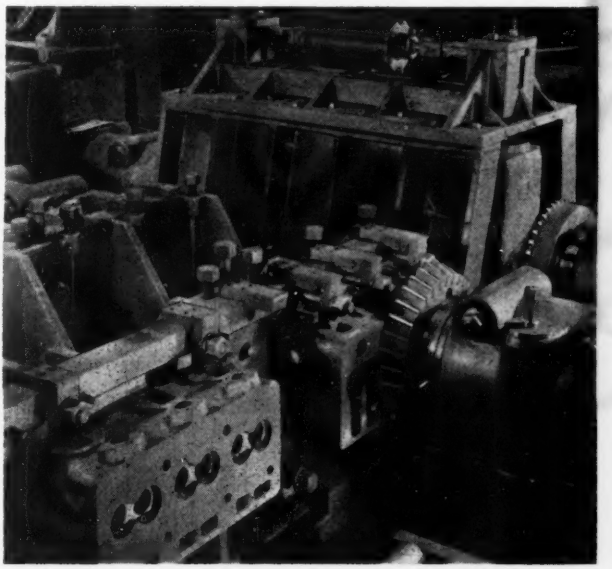


Fig. 3 — Airclamps are Used to Hold Workpieces in Position. Note Air Cylinder at Top of Fixture at Right

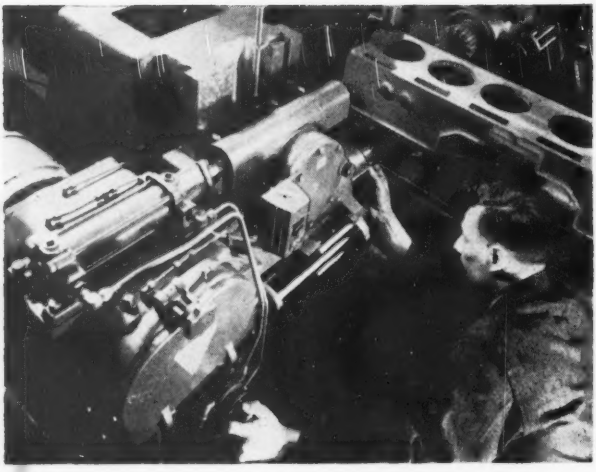


Fig. 4—Milling Pads on Crankcase. Setting of Cutter is Determined by Use of Stops in Turret

the manufacture of Diesel engines, and today has in production 21 sizes of standard "in line" type Diesels and 17 sizes of gasoline, natural gas, and butane engines.

The Buda Company has recently developed two new series of engines, one of which is the "161" series of automotive Diesel engines. The manufacture of this engine involves the use of a number of interesting operations and tools, some of which are discussed in this article.

The illustration Figure 1 shows the rough and finish milling operations on the top and bottom of the "161" cylinder block. The bearing cap slot is rough milled and the oil pump mounting pad is finish milled on an angular plane in this same operation. The machine is a Fitchburg special horizontal milling machine using six inserted tooth cutters.

An interesting feature of this machine is the mechanism by which the mounting pad is machined, the spindle that carries the cutter for this operation is moved forward at the correct moment for it is operated hydraulically and is withdrawn upon the completion of its operation by the same means. As the table reaches the correct position in its movement past the cutters, it operates to open and close the hydraulic valve. The roughing cutters on this operation are tipped with stellite and the

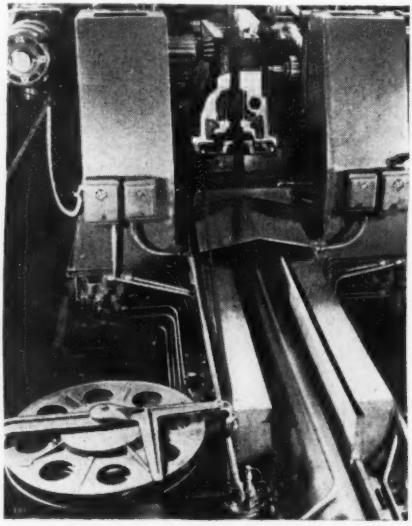
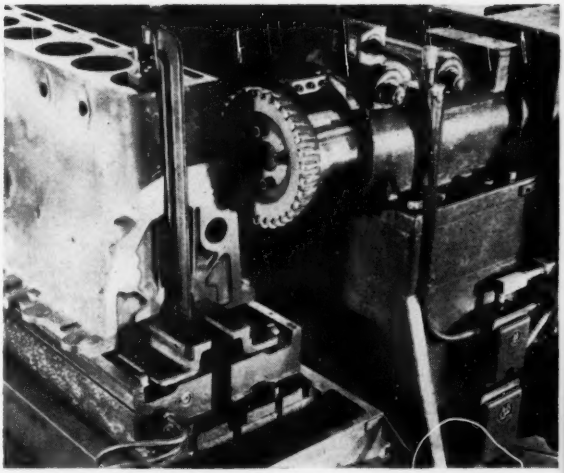


Fig. 5—Air for Operating Clamps is Provided Through Hose Wound on Spring-Controlled Reel

Fig. 6—Showing Connection of Air Hose to Machine Table. Ducts are Provided in Fixture Base



finishers are tipped with carbide.

The illustration Figure 2 shows the operations of rough and semi-finish milling the tops and bottoms of four cylinder heads and rough and finish milling the two ends of the crankcase. Here again a special four spindle Fitchburg milling machine is used, using stellite and carbide inserted tooth cutters. The fixtures which hold the cylinder heads are so located on the table that the cutters will be set at exactly the right distance to obtain the correct lengthwise dimension over the ends of the crankcase. The crankcase is clamp-

Fig. 7 (Below)—Cylinder Bores are Machined in This Moline Boring Machine, Equipped with Davis Bars

Fig. 8 (Right)—Drawing Illustrating Design of Expanding Cutter Used to Machine Chamfer inside Bore

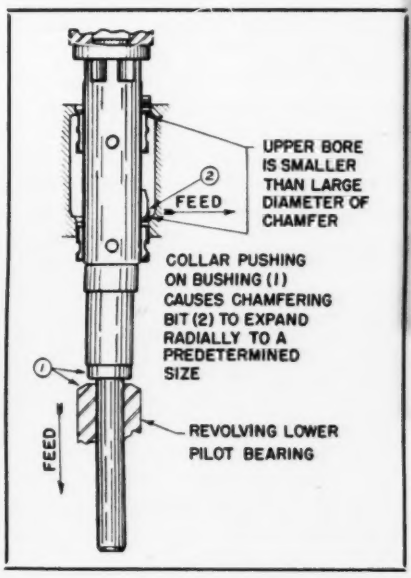

UPPER BORE IS SMALLER THAN LARGE DIAMETER OF CHAMFER
2
FEED
COLLAR PUSHING ON BUSHING (1) CAUSES CHAMFERING BIT (2) TO EXPAND RADIALLY TO A PREDETERMINED SIZE
1
FEED
REVOLVING LOWER PILOT BEARING

Fig. 9 — Drilling and Step-Drilling Air Cell Holes in Cylinder Head

ed in position by two toggle clamps, operated by the air cylinder shown at the top of Figure 3.

The machine shown in Figure 4 is used to mill a number of pads on the side of the crankcase. This machine is a Fitchburg special duplex milling machine equipped with a set of locating rods by which the setting of the cutter is determined for milling the pads in several different planes. The stops are located in a turret which, upon being revolved to bring each stop into position in turn, actuates a selector valve controlling a hydraulic cylinder which positions the cutter correctly for the next operation.

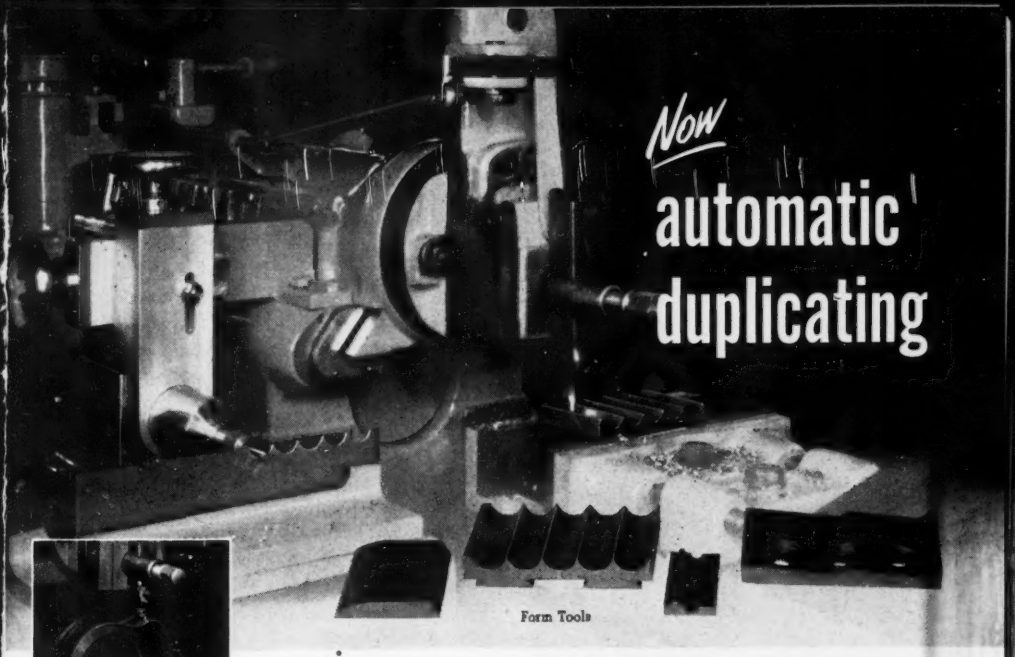
The spindle is adjustable both vertically and horizontally, and the fixture is designed to accommodate crankcases for one, two, three, four, six or eight-cylinder engines. The cylinder is clamped in position by the use of pneumatic - operated clamps.

Considering that the clamps used in the operation shown in Figure 4 are operated by air, the application of the air to the clamps on a moving table presents a nice problem. However, in the present instance this problem was solved by the use of the equipment shown in Figure 5.

The equipment consists of an air connection to a hose mounted on a reel which is controlled by a strong spring. The hose is connected to the air connection of the clamp on the machine table in such manner that, as the table feeds past the cutters, the hose can unwind from the reel and as the table is moved back into loading position again, the spring revolves the reel and winds up the slack hose.

The illustration Figure 6 shows the connection of the air hose to the machine table. Ducts for the air are provided in the fixture base, and the air control is mounted on the side of the table, as shown in the illustration. The clamping arrangement is as efficient as it is simple.

The piston holes in the cylinders are



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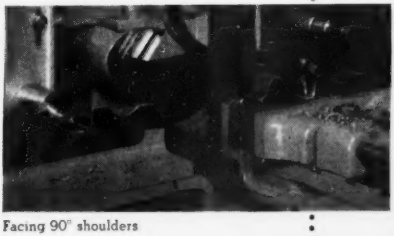

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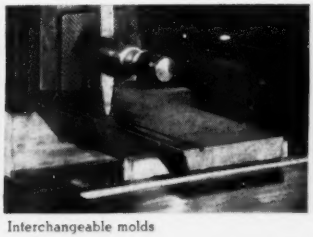

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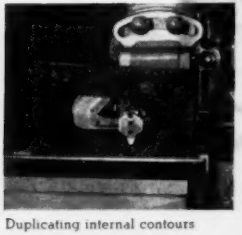

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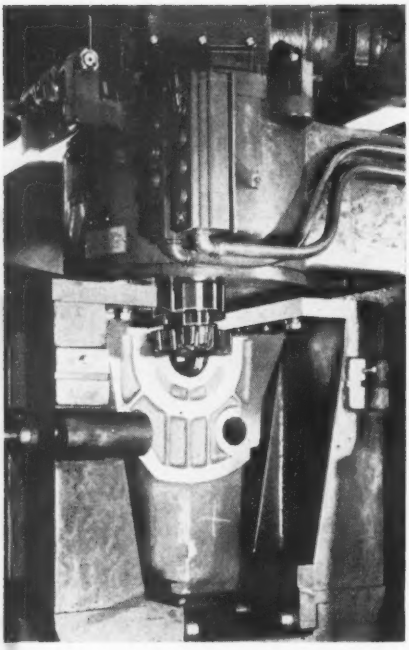

Fig. 10—Milling Bearing Cap Slots in Crankcase. Cutter Heads can be Reset by Means of Worm for Finishing Cut

bored with the use of the equipment shown in Figure 7. The machine is a Moline cylinder boring machine, equipped with special Davis boring bars to bore the six cylinder bores complete. The crankcase is clamped in position by the use of air clamps. Each bar carries rough and finishing cutters, as shown in the drawing Figure 8.

The interesting feature of this job is that a chamfer has to be cut in the bore on a diameter larger than the entrance to the cylinder, which means that the chamfering cutter must be expanded to the correct diameter after it has entered the cylinder. To accomplish this, the pilot on the lower end of the bar carries a collar which, as the bar is fed downward, strikes and revolves with a Timken-bearing-equipped pilot bushing. As the downward feed continues, the thrust collar is forced against the cutter-expanding mechanism, causing the chamfering cutters to expand radially to the required size. As the bar is withdrawn from the hole, the thrust collar moves downward again, permitting the chamfering cutters to contract into the bar.

The operation of drilling and step-drilling the fuel nozzle injector holes and air cell holes in the cylinder head for the triple bore cylinder block is shown in operation in Figure 9. In this operation two two-way Natco multiple spindle boring machines are used, each equipped with a double-deck fixture to permit the machining of two workpieces simultaneously. Each of the step-tools machines four diameters and three tapers, and each tool holder is equipped with Timken bearings to prevent galling of the tool holders or workpieces as the tools are fed to their full depth.

The operation of milling the bearing cap slots in the crankcase is shown in Figure 10. The machine is a Fitchburg, especially designed for this job. The spindles are mounted in a head which can be revolved with an eccentric motion by means of the handle and worm gear shown at the upper left-hand corner in the illustration. The large cutter shown at the front in the illustration is used to mill one side of the slot and the bearing cap contact face. The small cutter mills the opposite side. Then, by means of the hand-operated worm, the head is revolved to obtain a fine adjustment which enables a finishing cut to be taken with the

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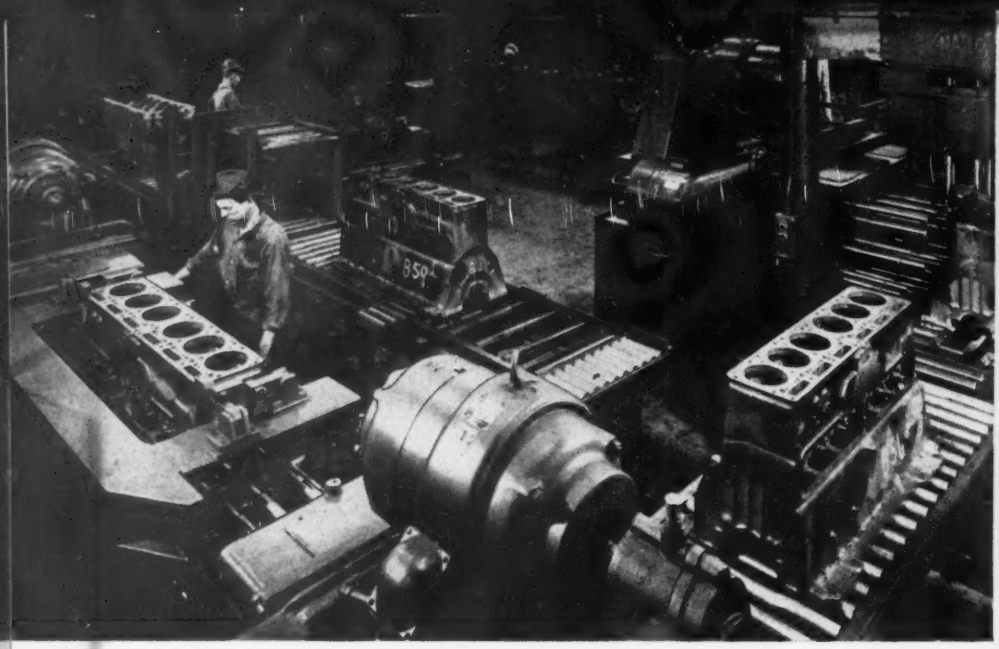

Fig. 11—Layout of Multiple Tapping Machines in Cylinder Block Line

dimension held within 0.001 inch of the drawing specification.

The illustration Figure 11 presents an over-all view of the cylinder block line, showing the sequence of multiple tapping machines. The multiple spindle machine on the far side of the line is being used to tap the oil pan bolt holes in the bottom of the crankcase. The double-end tapping machine at the left in the illustration is being used to tap the end holes in the crankcase, and the multiple spindle two-way Natco shown at the right is used to tap all the holes in both sides of the crankcase.

Air clamps are used to hold the work in position in each of these machines, and all loading is done by means of roller conveyors.

The job shown set up in Fig. 12 is well worth mentioning in this article, for reasons which are not apparent to

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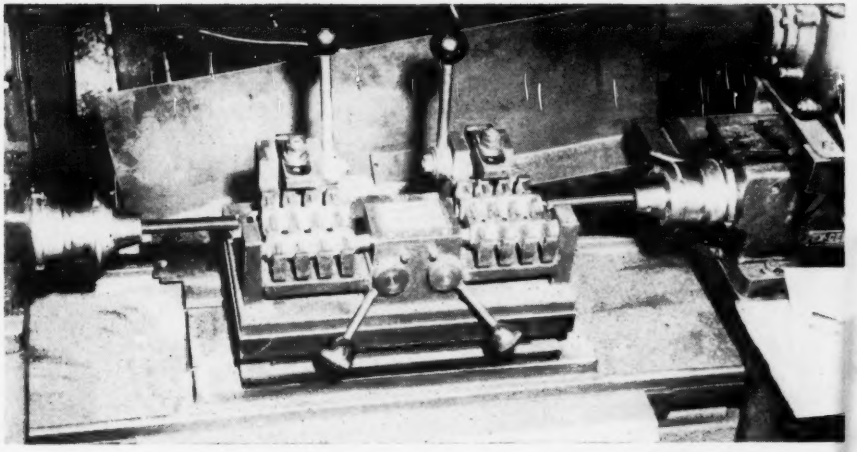

Fig. 12—Finish Boring Rocker Arm Shaft Bracket Clusters, Using Single-Point Tool in Solid Carbide Boring Bar. Ratio of Hole Length to Diameter, 5 : 1.

the observer. Here an Ex-Cell-O Precision Boring Machine is being used to finish bore the shaft holes in rocker arm shaft bracket clusters, the total length of the bore being five times the diameter of the bore.

Using a boring bar of machine steel, the deflection of the bar under the stress of the cut produced a "bell-mouth" at the start and end of the cut. Inasmuch as the diameter of the bar was limited by the diameter of the bore, the problem became one of finding a material for the bar which would be sufficiently rigid to eliminate the trouble.

As an experiment, a boring bar was made of solid carbide—and this proved to be the solution. Although expensive, so far as first cost is concerned, the solid carbide bars have proved their worth through their resistance of deflection and the high degree of accuracy which is assured through their use.

Part II of this article will appear in the August Issue.

"Stalin's Counting on Inflation" is the title of a 12-page booklet designed to explain the necessity of a "pay-as-you-go" tax program to beat inflation. The argument is presented in the form of one or two sentences of explanation on each page, accompanied by a drawing in cartoon style to illustrate the point.

The booklets are available from the National Association of Manufacturers, 14 W. 49th St., New York 20, N. Y. For distribution to employees or community leaders, 50 copies will be sent free of charge. Above 50, in lots of 1 to 500 the price is 2.7 cents per copy; 501 to 1,000, 2.6 cents per copy; 1,001 to 5,000, 2.5 cents per copy.

An important message to readers of MODERN MACHINE SHOP will be found on page 345.

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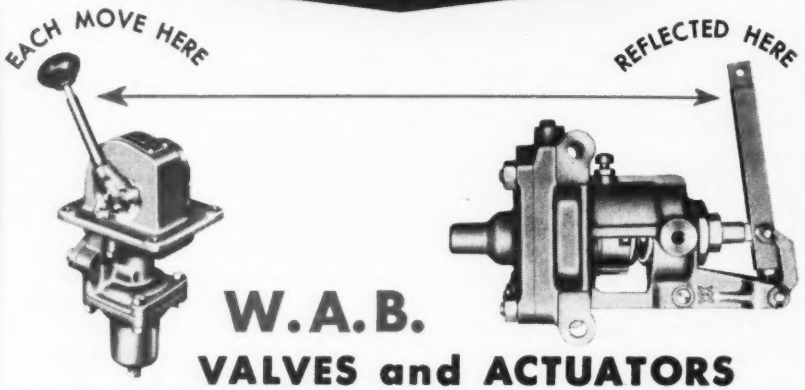

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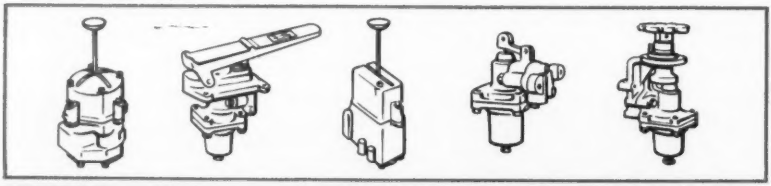

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This user gets more production per dollar invested, by replacing old type equipment with a modern SUPER SERVICE Radial.

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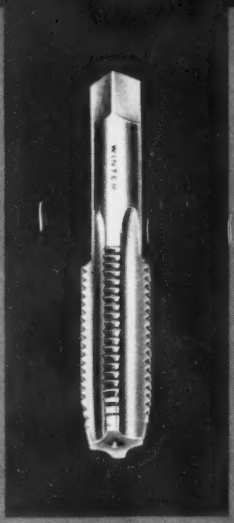

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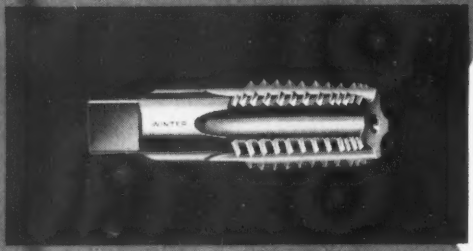

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WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company, Rochester, Michigan, U.S.A. • Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

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Size accuracy in the original tool is an important factor in reamer manufacture. Equally important is the reamer's ability to maintain its original size, since this determines the life of the tool. National Reamers are carefully ground to size within extremely close limits. Long and useful tool life is assured by careful material selection and heat treatment, and correct proportions of lands and flutes. Reamers are part of the complete National line of rotary metal cutting tools, which also includes twist drills, milling cutters, end mills, counterbores, hobs, and special tools.

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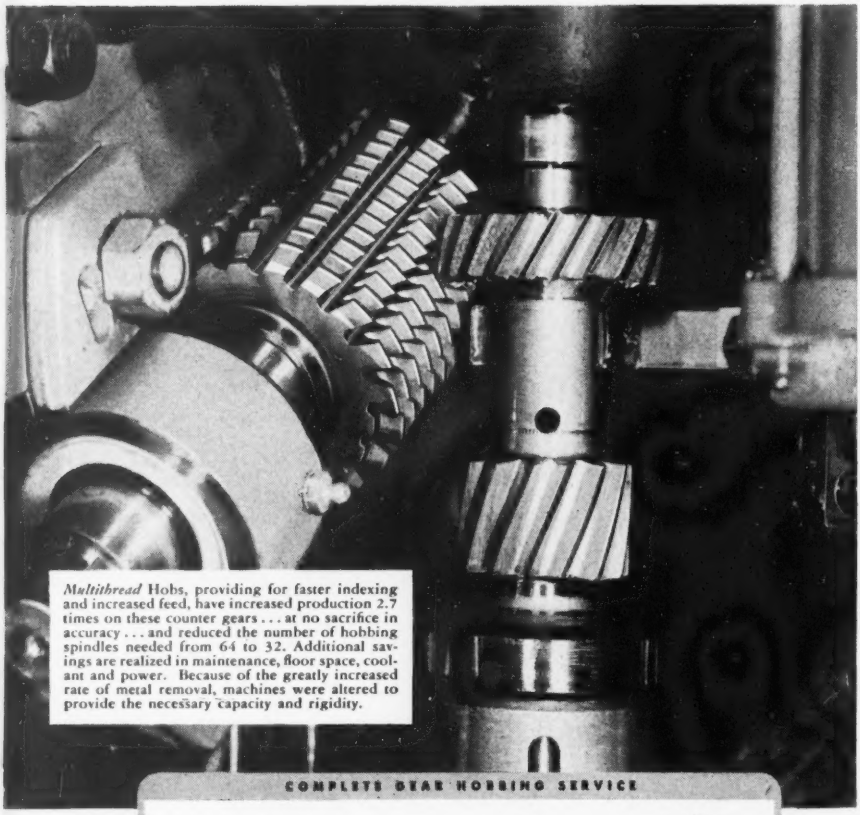
Barber-Colman

Multithread Hobs

TRIM GEAR CUTTING COSTS



Multithread Hobs, providing for faster indexing and increased feed, have increased production 2.7 times on these counter gears . . . at no sacrifice in accuracy . . . and reduced the number of hobbing spindles needed from 64 to 32. Additional savings are realized in maintenance, floor space, coolant and power. Because of the greatly increased rate of metal removal, machines were altered to provide the necessary capacity and rigidity.

COMPLETE GEAR HOBBING SERVICE

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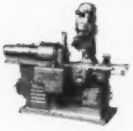
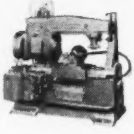
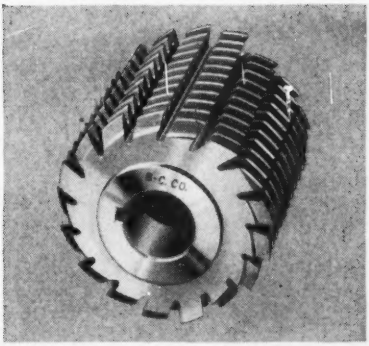
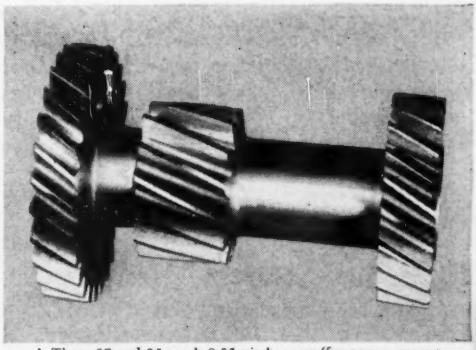




HOBS • MACHINES • SHARPENING • TECHNICAL DATA



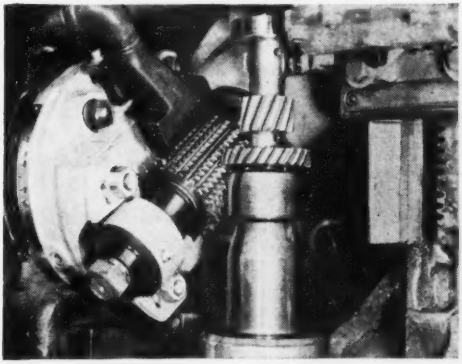
▲ These 4" x 4" *Multithread* hobs have more gashes for finer finish. A taper hole eliminates runout, holding the pitch line of the cut gears to maximum concentricity. Precision spacing of 3 leads produces involute and tooth spacing to preshave limits.



▲ These 27 and 22-tooth 9.25 pitch gears (for passenger car and truck transmissions) are forged from AISI 5145 or 8620-H steel. *Multithread* hobs have cut costs per gear to slightly over 1/3 former average. Lead errors are held within .0005". Production per hour has been increased from 26 to 82 gears (net, at 85% efficiency).

Automotive Plant Pioneers New Hob Application with Barber-Colman Hob Engineers. Disregards Conventional Hob Design to Almost Triple Production. Cuts Costs to ⅓ Previous Average.

▼ The 27-tooth gear on the counter gear is hobbed at 156 rpm and .062" feed. Previous feed was .053". Face width is 5/8". Cutting time per gear has been reduced from 6.55 to 2.2 minutes. Remarkable savings are possible because of increased feed and faster indexing with *Multithreads*.



The 22-tooth gear on the counter gear is hobbed at 156 rpm and .052" feed. Cutting time is 2.16 minutes. Single-thread ground hobs formerly cut at .043" feed. Hobbing time averaged 6.13 ◀ minutes per gear.

Multithread Hobs are a development by Barber-Colman engineers, providing faster indexing in the hobbing of gears. Instead of the usual single lead, *Multithreads* have several threads, and have produced unusual production increases on gear cutting jobs requiring very high rates of output.

As a result of production gains possible with hobs of this design, a fewer number of hobbing machines are required to complement the finish shaving and grinding equipment.

Multithreads are recommended only on the basis of comprehensive analysis of the job factors in individual plants. Therefore, we suggest that you ask a Barber-Colman Representative to call.

Write for additional information about the production increases possible with *Multithread* Hobs.

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BUILDERS OF PRECISION GEAR HOBS AND MACHINES SINCE 1911

High Strength Fastening

Methods of joining light aluminum alloy structures to withstand tremendous stresses imposed by supersonic flight speeds.

By Gilbert C. Close

THE continuous trend toward lighter product construction while often increasing service operation loads and stresses has focused a considerable amount of attention on the problems of high strength fastening. This is true particularly in the aircraft industry where light aluminum alloy structures must be joined together in a manner to withstand the tremendous stresses imposed by supersonic flight speeds. The rivets and bolts used to hold these structures together are in themselves a weight problem due to numbers, and when a gram of weight can be shaved from a rivet or bolt, the weight saving increment over the entire airplane amounts to substantial proportions.

The same problems prevail to a lesser extent in any industry interested in producing strong yet light weight products. Aluminum or magnesium

Fig. 1 — Illustration showing typical hot dimpling operation in Northrop shops.

bus and truck bodies, lightweight metal furniture, aluminum or magnesium tools, or aluminum structural units are but a few such products to mention. In each case, to fully utilize the inherent strength of the structural metals, high strength fastening together of product components is necessary. Complex joints, large overlaps, stiffener plates, and so on, add to the cost of manufacture and increase weight, thus defeating the prime purpose of obtaining maximum lightness. The one answer is to use the necessary fastening devices (bolts, lags, rivets, and so on) in a manner to secure maximum strength with a minimum number.

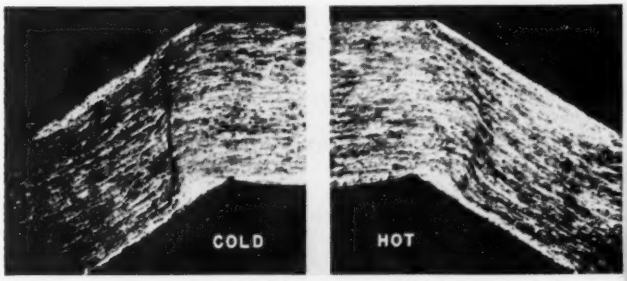

Fig. 2 — Illustration showing shear crack which developed in a cold formed dimple, and the even grain flow and absence of severe stress areas in the hot formed dimple.

The problems of high strength fastening are not as simple as they first appear. Metallurgical values are involved, along with tolerances and techniques that demand careful study. To throw some light on this subject, engineers and metallurgists at Northrop Aircraft, Inc., have spent years studying the various situations that occur in airplane assembly, and methods of installing fasteners to obtain maximum strength with minimum weight. This article is based on the Northrop studies, thanks to information furnished by T. E. Piper, Northrop Process Engineer. Only those subjects that have received studious attention, and as a result have been bettered or resulted in new developments, are covered. The information should be of real and practical value to any shop man faced with the problems of high strength fastening or joining.

Dimpling Developments

Industry makes use of rivets in many forms and for many purposes, yet definite data relative to the production of a high strength riveted joint is scattered and often irrevelant. This is particularly true in conjunction with flush riveting where the material riveted must be dimpled to receive the tapered rivet head. Dimpling is usually employed on sheet metal overlap joints where exterior smoothness is required, and where the material itself is too thin to allow for countersink drilling. Under these conditions, the method used to fabricate the dimple and the contours and angles of the dimpled metal may contribute more to joint strength than the rivets themselves.

As the new 75S aluminum alloy is used in most high strength applications, the Northrop studies in dimpling centered on this material. It was found that by introducing a thickness direction stress, the formability of the sheet material was raised sufficiently to eliminate radial cracks during

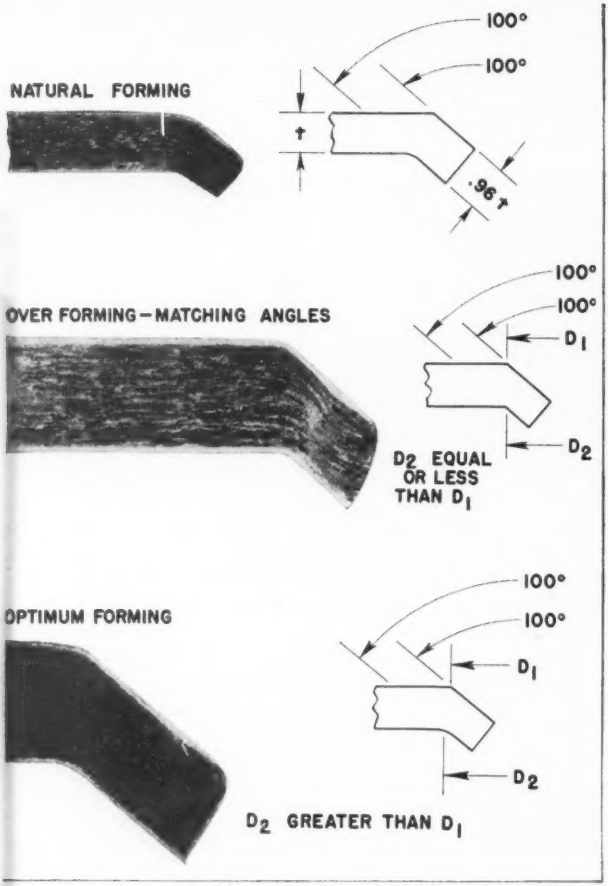

Fig. 3—Illustration showing cross sections and dimensions of three types of dimples investigated.

dimpling. On the other hand, shear cracks would occur when the material was dimpled cold and excessive sidewall coneing was used. To offset this shear cracking, heated dimpling dies were tried. No shear cracking occurred with the heated dies, and the hot dimples were found to be up to 15 per cent stronger than cold dimples of the same configuration. By using elevated temperatures, the degree of work hardening and the possibility of cracking are minimized so that the parts retain adequate strength and ductility.

During the research, three types of hot formed dimples were investigated, and the advantages and disadvantages of each type charted. The three types are as follows:

1. Natural formed dimples based upon the principles of using one die set for all material increments, i.e. accounting for the normal thinning from circumferential and radial strain.

Advantages

a. Minimum die pressure required.
b. Good structure obtained with no regions of high internal shear.

Disadvantages

a. Poor definition when used over a wide range of sheet gages.
b. Poor nesting in multiple stacked sheets.
c. Requires use of 100 deg. and 105 deg. countersinks in the shop.
d. Requires generous female die radius to avoid circumferential cracking in screw dimples.

2. Over formed dimples were devel-

oped to permit multiple stacking and close nesting of dimpled parts.

Advantages

a. Sharp definition.
b. Permits multiple stacking.
c. Permits use of a single 100 deg. countersink.
d. Reduces tendency toward circumferential cracks.

Disadvantages

a. Requires greater forming pressures.
b. Produces critical shear deformation in heavier gages.

3. Optimum formed dimples which proved superior to the other two types for dimpling the material used in aircraft construction.

Advantages

a. Shear deformation reduced to negligible point.
b. Good definition in all gages.
c. Multiple stacking and 100 deg. countersinking produce the best possible nesting with no loose dimples.
d. Superior strength and definition.

Figure 1 shows a typical hot dimpling operation in the Northrop shops. Figure 2 illustrates the shear crack in a cold formed dimple, and the even grain flow and absence of severe stress areas in the hot formed dimple. Figure 3 shows the cross sections of and gives dimensions for the three types of dimples investigated. It is immediately evident that die construction controls the type of dimple procured.

Blind Riveting

While blind rivets have been available in several forms for many years, recent developments in rivets of this type and definite service and stress data now makes it possible to employ them in many instances where high strength fastening is necessary. Blind rivets are particularly useful in the fabrication of riveted joints where only one side of the structure is available.

A recently developed blind rivet, and the one used almost exclusively in the aircraft industry (the Cherry Hi-Clinch Rivet), is shown in Figure 4.

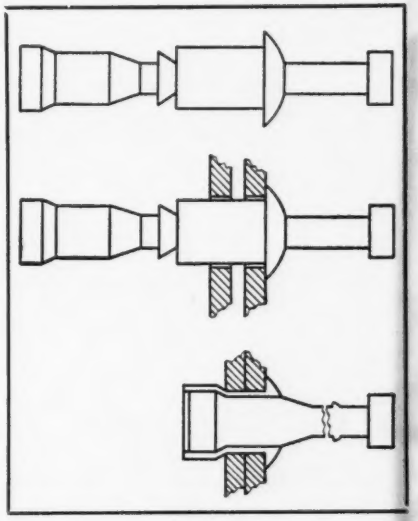

Fig. 4—Drawing of recently developed blind rivet showing (Top) rivet before installation; (Center) rivet installed in a pair of sheets ready for clinching; and (Bottom) rivet after clinching.

The desirable features of this rivet include good clinching action, high strength, and accessibility.

The action of this high strength fastener during installation is shown also in Figure 4. The top view shows the rivet before installation; the center view shows the rivet installed in a pair of sheets ready for clinching. The bottom view shows the rivet after clinching.

The principle advantage of this rivet is its tendency to clinch the sheets together during installation. This clinching tendency is brought about by the collar on the rivet shank. The collar first expands the rivet shank against the back sheet, then the tool force on the rivet stem draws this back sheet firmly against the front sheet. After the sheets are together, the resisting force against the collar will either shear off the stem and slide up over the plug section, or will collapse against the plug section and pull on through with the stem.

The plug section of the stem is then pulled into the rivet, further expanding it. The stem then breaks at a predetermined place. The rest of the protruding stem is then trimmed off, and the riveting operation is complete. Figure 5 illustrates the simplicity of blind riveting in production.

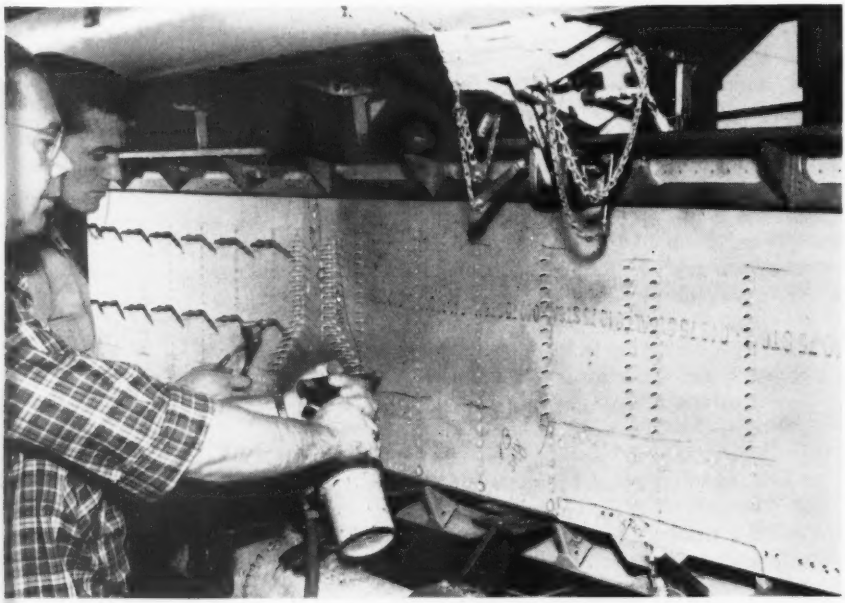

Fig. 5—Illustration showing simplicity of blind riveting method in production.

Special High Strength Fasteners

A few special high strength fasteners have been developed for use in the aircraft industry, and some of these fasteners would prove valuable in other types of industrial assembly. One that received considerable study by Northrop engineers and now is being used extensively in critical assembly work is the Huck Lockbolt. This fastener is much cheaper and faster to use than regular AN bolts, and exhibits the high shear resistance necessary for this type of fastener.

The Huck Lockbolt is easily and quickly installed using pneumatic

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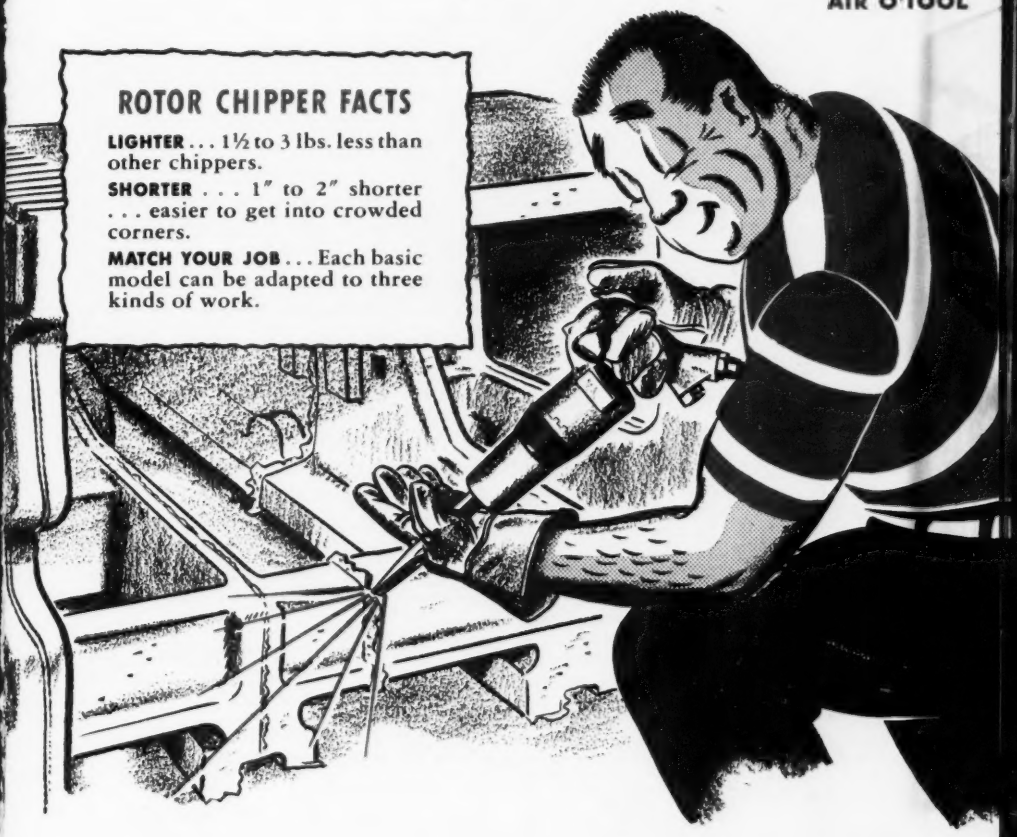

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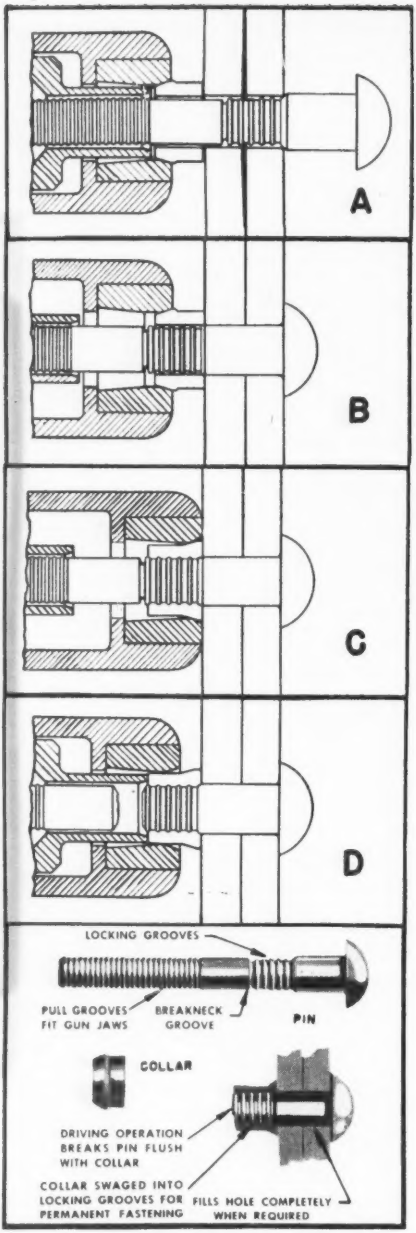

Fig. 6—Cross sectional views of Huck Lockbolt with installation tool nose shown at various stages of installation.

equipment. Installation time, according to time study data, is about one-third that of normal bolts. Figure 7 shows one of the many typical installations on the Northrop F-89 "Scorpion" fighter airplane. Figure 6 shows cross sectional views of the Lockbolt and installation tool nose at various stages of installation.

Four easy steps are required to install the Lockbolt as follow:

1. The pin is inserted from one side of the work; the locking collar is then inserted over the Lockbolt pin tail extending through the hole. The gun is then applied as illustrated at **A** in Figure 6. After the gun has been installed on the Lockbolt pin tail, the jaws automatically engage the pull grooves.
2. Depressing the gun trigger exerts the pull on the pin. The reaction of the pull is taken against the collar by the swaging anvil. This pull draws the work tightly together and, after the faying surfaces are in intimate contact, the pin is wire-drawn into an interference fit hole, simulating a bolting-up operation. This is shown at **B** in Figure 6.
3. As the pull on the pin increases, the anvil of the tool is drawn over the locking collar, swaging the collar into the locking grooves of the pin to form a rigid, permanent lock. This is shown at **C** in Figure 6.
4. Continued build up of tool pulling pressure automatically breaks the Lockbolt pin in tension at the breakneck groove. When the gun piston returns to its initial forward position, the ejector advances to disengage the

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Steel Mill Micrometers No. 203. For gaging hot metal. Heavy duty spindle, heavy cut graduations, wing head lock nut, "Satin Chrome" finish. Range 0-1".

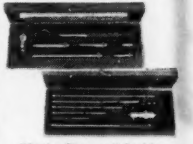

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Fig. 7 — Illustration showing Huck Lockbolt installation on inner wing assembly of Northrop F-89 "Scorpion" fighter plane.

anvil from the collar. This is shown at **D** in Figure 6.

The Huck Lockbolts have proved very useful for replacing high strength alloy steel and aluminum fastenings, and are readily adaptable to high volume production methods. Shear and tension allowables equal or exceed the values for equivalent AN* bolts. Hole tolerances for an interference fit may exceed those of AN bolts, and no reaming operation is required.

The Huck Lockbolts are available in 75S-T6 material as a standard item at this time. Only one workman, the gun operator, is required for installation. Lockbolt weight increment in a given assembly is about 50 per cent that of standard AN bolts. Under repeated loads in shear, the Lockbolt is stronger than the aluminum sheet material in the joint.

In laboratory tensile tests, the Lockbolt lasted many times as long as AN bolts. According to Northrop metallurgical engineers, this is due to the high forces that prestress the pin in tension, thus giving it strength properties comparable to those of a highly torqued AN bolt. This high tensile pre-load insures excellent tension fatigue strength. In fact, this pre-loading is great enough to pull sheets together during installation through a distance of $\frac{3}{16}$ inch. In most cases, working clamps or fitting-up bolts need not be used. Figure 8 is a comparative illustration between Huck Lockbolts and standard AN bolts installed in an airplane joint.

*In the aircraft industry, all standard S.A.E. bolts are referred to as "AN" bolts because they conform to applicable Army-Navy Specification requirements. Therefore, an "AN" bolt is a standard bolt threaded to S.A.E. specifications.

NACA Riveting Method

The NACA type of riveting (See Fig. 8) was developed and put into general production practice at Northrop for the highly stressed F-89 airplane exclusively. It offers the strongest possible flush riveted type of joint that can be obtained with aluminum rivets in a cut countersunk application.

With this method, it is first necessary to drill holes from ten to fifteen thousandths larger than the rivet shank diameter. The surface side of

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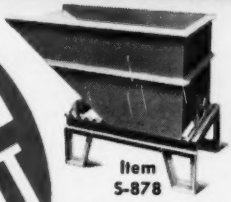

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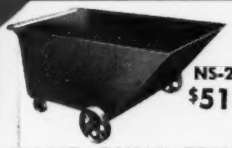

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$51.15

HAND DUMP TRUCK

Reinforced heavy sheet steel. ½ cubic yard, capacity—two 8" semi-steel wheels and two 4" metal swivel casters. Wt. 125 lbs.

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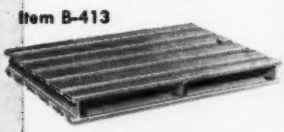

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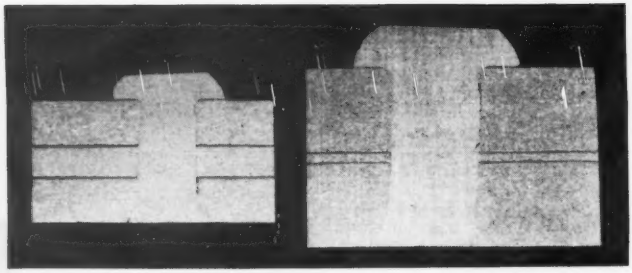

Fig. 8—View at left shows cross section of NACA flush riveted part. View at right shows cross section of AD (non-heat treatable rivet made of 17ST aluminum alloy) riveted part.

the structure is then cut-countersunk at 60 deg. angle to a given diameter, usually twice the diameter of the rivet shank.

In installing this type of rivet (See Fig. 9) it is necessary to insert the rivet on the side **opposite** the countersink. The shank of the rivet must protrude through and past the structure approximately one and one-half times the shank diameter. At this point, either a flat or cup-shaped bucking tool is applied to the manufactured head of the rivet, and a rivet gun to the shank so as to drive the shank into the 60 deg. countersink and accomplish a complete swelling effect in the countersink and the drilled hole. A flat rivet set with a very small pneumatic riveting hammer is used in normal assembly line practice. Pneumatic squeeze riveting is also adapted to NACA riveting, particularly in subassembly fastening of detail parts.

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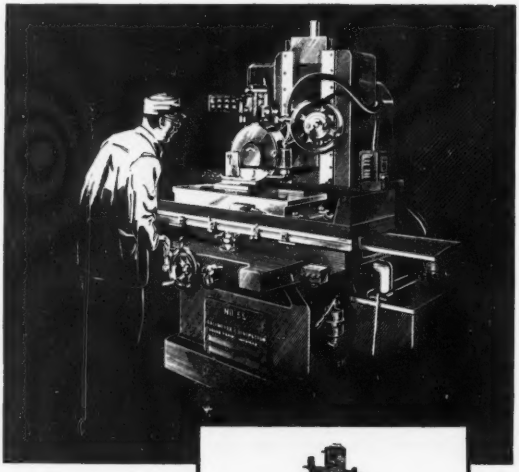

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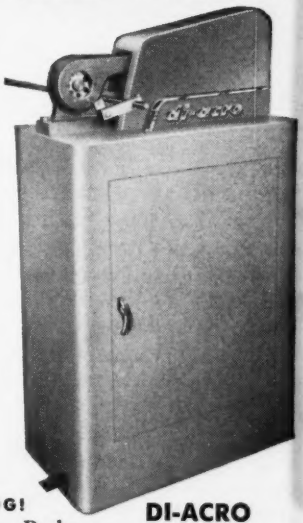

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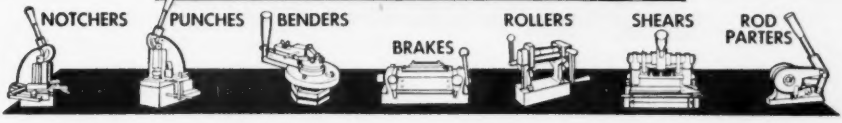


Fig. 9 — View showing two man method of installing NACA rivets.

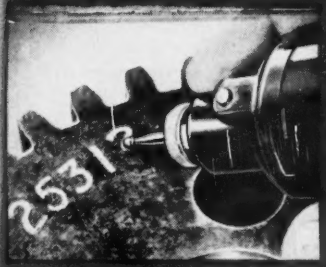
(swelled) into its countersink, it is then necessary to shave or mill flush by means of hand equipment what is left of the protruding shank head so as to produce a smooth surface finish. Figure 10, showing the manufactured head side of NACA rivets, shows the extent to which these rivets are used in the F-89 airplane. NACA rivets are of 24S or A17S aluminum alloy material. For those unacquainted with conventional aircraft riveting, it can be said that before development of the NACA rivets, all rivets were set using the riveting gun against the manufactured head with the pucking bar against the shank. With NACA rivets, this method is reversed.

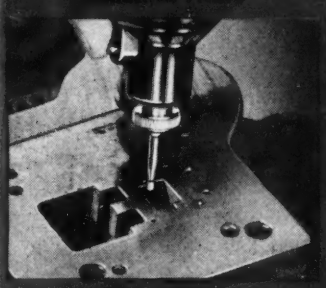
General Discussion

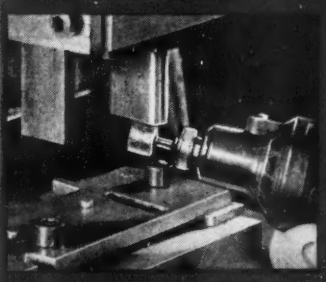
T. E. Piper points out that every company using standard AN bolts in high strength fastening should give some study to the actual operating stresses to which the bolts are exposed, then tighten the nuts so that the stresses generated by nut tightness were about equal to the operating stresses. Under such conditions of installation, the bolt would be much less subject to operational stress fatigue.

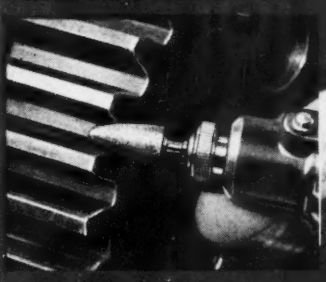
AN bolts are engineered products capable of satisfactory control, Piper points out. Their uses are almost infinite over a wide range of service conditions which modify and determine their behavior. Most of the difficulties in the use of bolts stem from the problems of producing preloading during tightening and maintaining it through the life of the bolted device.

Pre-loading of bolts is also useful in applications where the joint is loaded in shear. The endurance life of a bolt in comparatively rigid parts increases rapidly as the bolt is progressively tightened and becomes infinite as the initial bolt tension approaches the maximum bolt load applied to the assembly. The reason for this is that increased pre-loading reduces the amplitude of stress change in the bolt to a safe value. This resistance of the bolt to fatigue is dependent solely upon the pre-loading of the bolt and is not









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affected by factors such as surface conditions of the bolt or similar stress raisers that might otherwise lead to early bolt failure.

The method most generally used to pre-load bolts is the ordinary hand wrench, sometimes equipped with a torque measuring device. Where precise pre-loading of bolts is required, it is usual to determine the pre-loading by measurement of the elastic extension of the bolt as the bolt or nut is torqued. By calibration, the required elastic extension of the bolt for a given load is determined. This procedure has obvious disadvantages for high production work.

The inherent properties of bolts are known and definite, Piper continues. The usefulness of these properties, however, is modified greatly by conditions of use. Improper design of bolted parts, or improper assembly, can destroy the utility of even the finest bolt. Since applications vary over such a wide range, it is difficult to establish standard rules for the use of bolts.

Fig. 10—Illustration showing extent to which NACA rivets are used in the F-89 plane.

"It would be of economic advantage to all, and would provide a most efficient procedure, if the mechanical and shop fields should sponsor a joint research group that would compile and authoritatively codify present knowledge and engage in research where important problems are found to exist in conjunction with the use of bolts," Piper advises.

The Northrop studies in high

strength fastening and the release of this hard-won information for public use is a good step in the direction that Piper advises. However, this noted process engineer is quick to point out that much more is to be learned concerning joint efficiency in high strength, lightweight structures. The information in this article evolves mostly around high strength fastening in aluminum structures, and this facet of knowledge is becoming more important every day in conjunction with the widespread defense program and the increasing use of aluminum alloys.

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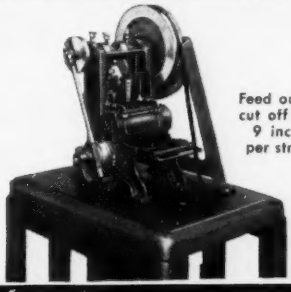

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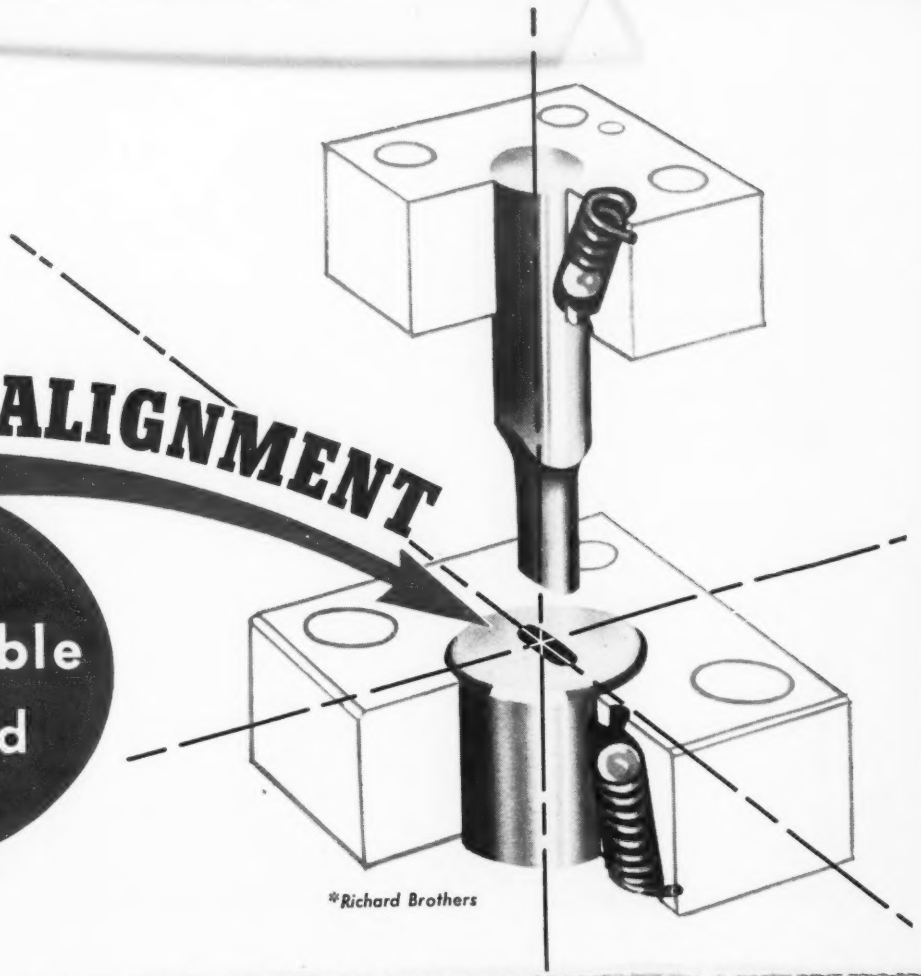

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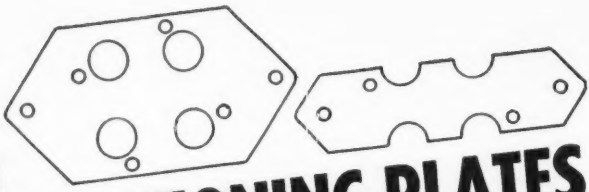

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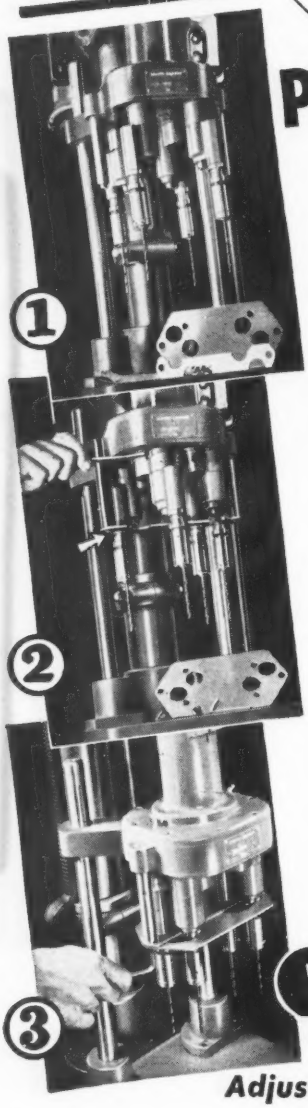

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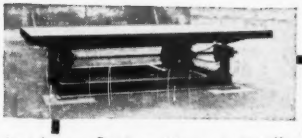

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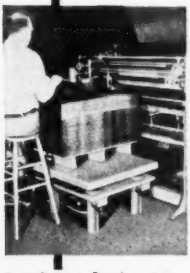
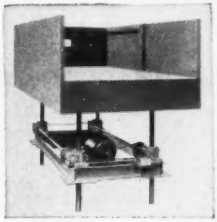


Portelvator; fixed position, automatic, self-leveling; for sheet feeding operation.



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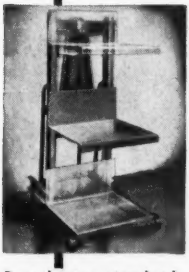

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Solar Aircraft Adapts Portable Tools To Production Needs

Use of portable tools enables Solar to increase production and lower cost.

By WARD E. WILLCUTT
Equipment Engineer, Solar Aircraft Company, San Diego, California

SHORTLY before the fighting started in Korea the Solar Aircraft Company embarked upon a program which called for the use of pneumatic tools for many of its portable tool requirements at its San Diego plant. In view of the flood of orders which has followed since for jet engine parts and other aircraft work, this proved to be a timely move because productivity has been increased and tool cost reduced.

The principal reasons why these improvements were effected are touched upon here for the benefit of those in the metal working industry who are constantly seeking for more economical methods of manufacturing.

In addition to the fact that pneumatic tools are notable for their ability to stand-up under rugged conditions and their trouble-free performance, factors which obviously extend their life, there also is the fact that pneumatic tools are offered for a wide range of operations.

The majority of the portable tools in use are of the grinder and drill types. Over half of the hoists in operation in the plant are now of the pneumatic type. In order to keep all air tools at full efficiency, the maintenance department checks once a month on turbine and vane types of pneumatic tools and once a day on the geared head type. The monthly check is mostly con-

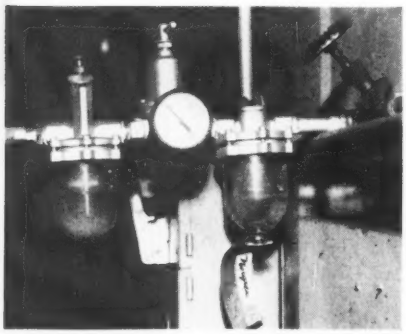
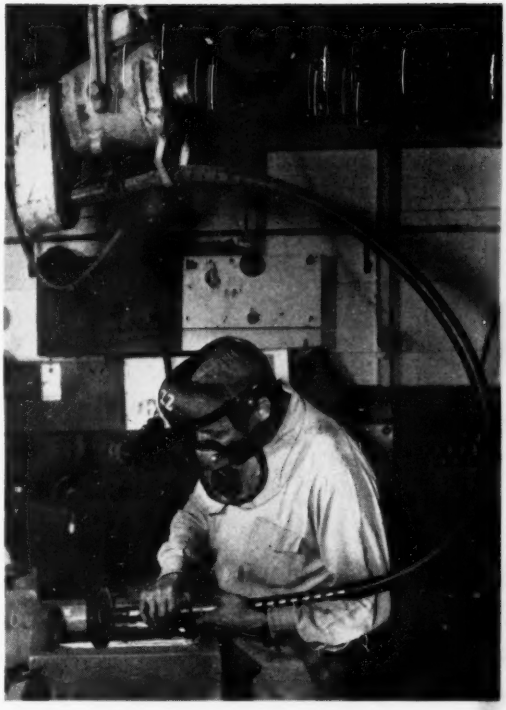


Fig. 1—Combination air filter, water trap, pressure regulator and oiler, as shown here, enables Solar Aircraft to maintain exact amount of air required for each work station.

Fig. 2 — Pneumatic grinders, as shown here, are used for polishing dies in the Kirksite foundry.



cerned with bearings and vanes and cleaning. The average repair time is 25 minutes, three-quarters of that time usually being just for cleaning. One reason why the maintenance check is so short and simple is that the tools are easily disassembled, repaired and reassembled. A substantial economy in repair parts has also been revealed.

Of course, the low maintenance-long life savings would be impossible without the vigilance kept to always provide clean, dry air to power these tools. All air lines are provided with filters, water traps, pressure regulators and oilers as shown in Fig. 1. Such units are located at each work station rather than for groups of tools due to the fact that different pneumatic tools use varying amounts of air and therefore require different settings on the oiler. By keeping the air supply dirt-free and maintaining constant air pressure so that tools will perform at capacity, substantial savings in maintenance and high productivity at the point of work are assured.

From the hundreds of examples which might be offered on increased productivity obtained with air tools one may suffice to illustrate this point. In the company's Kirksite foundry, as shown in Figs. 2 and 3, pneumatic tools are employed in the polishing of dies. Because of the high torque obtained with pneumatic tools, small grinders are used with torque ratings of from 22 to 24 pounds. In many instances the use of these tools not only enabled the productivity of the men using the pneumatic grinders to be doubled, but also improved the quality of their work because the light, compact pneumatic tool is easy to handle and thereby reduces fatigue.

Selection of the tool most suitable for the work to be performed is a vitally important consideration in connection with worker productivity. In view of today's urgency for production as well as the demand for higher hourly wage rates, this subject cannot receive too careful attention. For example, the proper selection of one type of grinding wheel over another can mean, in some

Fig. 3—Many types of air tools for polishing dies are employed in the Solar foundry. Three examples are illustrated here.

cases, a 50 per cent increase in output. Generally, the policy of Solar Aircraft is to select the largest wheel possible, of course determining whether it should be a cone, disc or some other type, and the best combination of grit and bond, and so on. Then, the pneumatic tool is selected which has the RPM and torque which goes best with the wheel.

There are times when it is necessary to compromise by adjusting the wheel to the tool. In citing this rule of thumb for selecting grinders it should not be implied that this is the extent of the effort in proper tool selection. On the contrary, it is a subject involving such extensive study that it cannot be fully discussed in this general article on the economies of pneumatic tools.

While still on the subject of tool selection, one of the important advantages found in pneumatic tools is that it is an easy matter to vary the speed according to the need, a feature not commonly found in other types of portable tools. This means that we do not have to keep on hand a larger than necessary stock of tools with various fixed speeds and of various sizes.

The added productivity possible with pneumatic tools still has not been fully covered in this article. To round out the coverage, it should be pointed out that the versatility and controllability of these tools has made it possible for Solar Aircraft to turn many hand jobs into power jobs and again, has eliminated waste motion by taking the tool to the work rather than the work to

Fig. 4—This pneumatic polisher for pierced holes replaced manual methods, reduced operation time from 11 minutes to 5 seconds, and eliminated spoilage. Part is a water manifold for a jet engine.

the tool. Two examples might be cited to show how this has been done in many instances.

Hand polishing formerly was performed around the pierced hole in a water manifold for a jet engine which is eyeletted in order to form a boss. If the edges around the hole were not polished entirely free of any punch marks, cracks would form from the hole through the boss. Time for the hand polishing was running from 11 to 14 minutes per hole. The operation was changed to use a 21,000 revolutions per minute small sized pneumatic grinder with $\frac{3}{16}$-inch diameter, rubber bonded mounted abrasive point as shown in Fig. 4. This setup enabled this operation to be performed in 5 seconds, instead of 11 minutes. Furthermore, there was an extremely high spoilage by a previous hand polishing method which was virtually eliminated by the pneumatic grinder method.

An illustration of how a portable tool is taken to the work instead of the work to the tool would be in the case of a drilling operation for flange hole in a jet exhaust cone. Formerly, this was done with a single spindle automatic drilling machine. This machine was replaced with a company made portable rig equipped with four air-fed drills mounted on it. An air hoist is used to lift the rig and lower jig and assembly in place for drilling, as shown limited. By using the air-feed method, four holes are drilled in less time than the original machine required for one. A further saving was due to the fact that drill life on stainless steel is limited. By using the air-field method, the feed just slows down to a stop as the tool becomes dull. With the positive feed machine, the drill continued at the same rate regardless of condition and eventually broke. The change to air-feed permitted a big saving in drills.

The ready availability of quick acting bench clamps adaptable for holding portable pneumatic tools is an important factor in the application of these tools to machine-type jobs. In cases where it is practicable to take the tool to the work, considerable handling time and other waste motion can be eliminated. Between the conversion of many hand jobs to pneumatic tool operations and the many cases where it

Fig. 5—Solar Aircraft engineers devised the setup shown here for taking air-feed drills to the work by means of an air hoist. The setup replaced taking work to a single spindle automatic drilling machine and in addition to handling time saved, did the drilling in less than a quarter of the time formerly required.

has been possible to take the tool to the work, Solar's uses for portable tools has increased by many times.

Before concluding a discussion of pneumatic tools, one more example might be cited which illustrates versatility of application in other ways than those which have been mentioned. One large sheet metal aircraft part, which has numerous holes punched through it, requires a deburring operation to slightly radius the edges of the holes. The part is too cumbersome to take to a conventional power machine drill press or pedestal grinder, with the result that the deburring formerly was done by hand.

A pneumatic tool manufacturer's representative helped solve this problem by taking a standard tool and adding a gear box from another type of tool to give a slow speed, compact tool which could be used in a small working area and left no chatter marks. A view of this tool in operation is shown in Fig. 6. The ability to throttle this tool made it possible to operate it at a speed of from 0 to 250 revolutions per minute with the complete control of tool chatter.

The advantages gained from the use of pneumatic tools applied under normal conditions with experienced workers in the plant are numerous. Now that a sudden expansion of activities has brought many "green" hands into the plant, the benefits become even more pronounced since the air-operated tools and other equipment in use are almost foolproof. Also, when it is realized that the increased production

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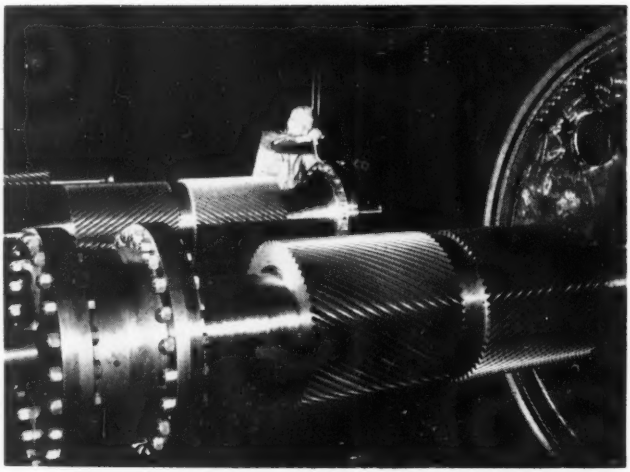
Fig. 6—Deburring of a sheet metal aircraft part, which is too cumbersome to take to a machine, is now done by using a standard pneumatic grinder with a gear box added so that speeds from 0 to 250 RPM can be had with complete controllability to prevent chatter.

obtained in the examples cited is multiplied by the hundreds of other similar applications throughout the Solar Aircraft Company's San Diego plant, it is felt that a very important step has been taken towards alleviating the manpower shortage which is currently being experienced under the call for greatly increased defense production.

Assembling Large Propulsion Unit Pinions and Gears

READIED for shipment to the Ingalls Shipbuilding Corporation, Pascagoula, Mississippi, pinions and gears are assembled by a workman at the Lynn, Massachusetts turbine plant of General Electric. The equipment will be part of the propulsion unit for a U. S. Maritime Administration prototype cargo-passenger vessel. The unit will consist of one cross-compound double reduction turbine gear set rated at 12,500 h.p. at 90 r.p.m. Design steam conditions at the turbine will be 850 p.s.i.g., 890 total temperature with exhaust to 28.5 in. Hg vacuum.



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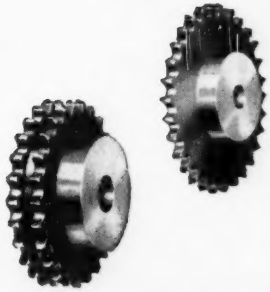

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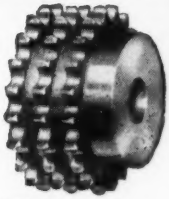

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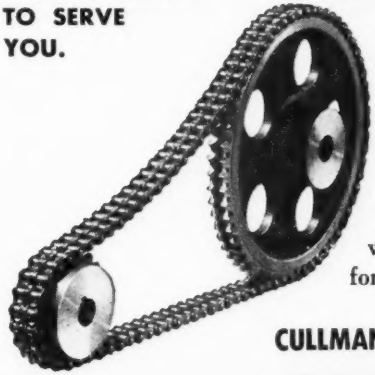

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SPROCKETS and CHAIN

Making A Quality Audit Of Manufacturing Operations

A simple technique for determining exactly what a machine, a process, a department or a shop is capable of producing in terms of quality.

By C. W. KENNEDY

ALONG with rapidly spreading defense orders, either in the form of direct contracts or as subcontracts and vendor orders, comes the relative certainty of the inspection and statistical quality control tests on a shop's products the procurement agencies of the Armed Forces will require. Part of a plant's preparation for accepting defense orders should doubtless include practical plans for assuring the required quality.

Though it may seem to be conceived under the duress of Army, Navy or Air Force regulations, the quality control program can also pay off in scrap and salvage savings to say nothing of opening the way to superior commercial or civilian products better able to cope with the sort of competition inevitably following the defense splurge.

This article will deal with a fairly simple, direct technique for determining exactly what a machine, a process, a department or a shop is capable of producing in terms of quality. The audit is intended to analyse first the capability of the machine itself and its tooling to meet requirements. It has the knack of wading through opinion, impressions, guesses and tradition to the facts of the operation's ability to meet specifications.

At the same time it presents a picture of the particular operator—whether or not he has the ability to get the best out of the tools and machine and whether or not he has the desire and conscience to do so. As a side dividend, the effects of production standards and incentives on quality can be evaluated. The stop watch boys sometimes impose conditions such that neither machine, tools nor operator can give the consistent quality desired. The audit usually too forces a review of engineering tolerances on blueprints. The question of whether parts are being produced to tolerances is often answered by reexamining the specifications and deciding perhaps they are unnecessarily restricting.

Finally, some of the system proposed and used for the quality audit can be

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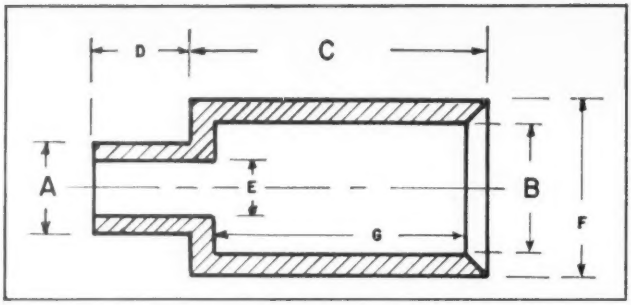


Fig. 1 — Drawing illustrating simple lathe or automatic operation.

readily shifted over as a basis for routine daily inspections helping to assure satisfactory, economical control and products that consistently meet defense order quality standards.

As for the cost of the quality audit in terms of payroll assigned to it and of gaging equipment, it has been found that the initial investment seldom exceeds, in terms of dollars, ten per cent of the savings gained from it during the first year afterward.

In anticipation of defense order quality requirements some plants have already adopted 100 per cent inspections —sorting defective and substandard units out of each batch of parts—in order to satisfy customer or Government. If the quality audit is followed up by a suitable chart control of the affected operations, if the mechanical and human faults disclosed by the quality audit are suitably corrected, 100 per cent inspections can very likely be eliminated. There is not only possible a payroll saving but also the relief from maintaining squads of sorters in today's tight labor market.

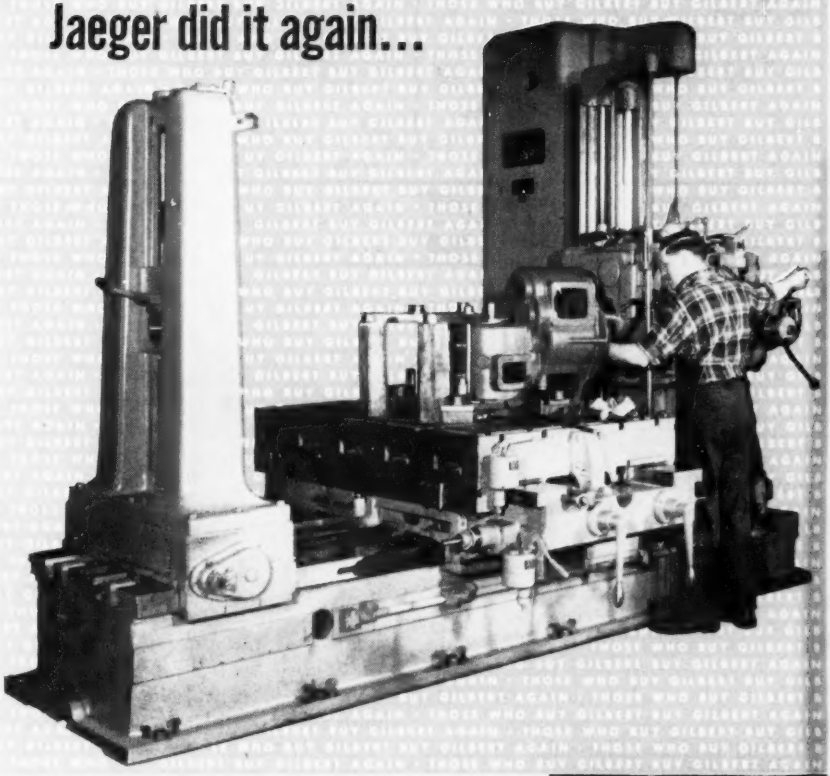
To get down to brass tacks, a reasonably simple lathe or automatic operation is offered as the first example. The quality audit technique, however, applies equally readily to practically the whole gamut of machine tools—millers, shapers, grinders, boring and honing operations and what have you. For the example here forming the type of part sketched in Figure 1 will be studied first.

Blueprint tolerances and knowledge of the use of the part will be put to indicate that dimensions **A, B** and **C,** Figure 1, are the "touchy" ones. At the same time, gross deviations from tolerances on the other dimensions should not be widely permitted. Reasonable workmanship in the matters of run-out, tool marks and burrs is also expected.

For the quality audit, then, select for study a type of part pretty much representative of the machine's ordinary production. Secondly, select for investigation an important O.D., or an I.D., for example, and a dimension in the other direction—a length. The presumption is that, if the dimensions picked for special study are brought under control and kept there, the other dimensions are quite likely to follow along. Rarely do more than three dimensions need to be studied for machine capability analysis and usually one diameter and one length will do.

Arrange to measure each of the selected dimensions—**A, B,** and **C** of Figure 1 in this case—with suitable indicating gages. Each gage used for machine capability studies should have dial markings, a "discrimination", capable of indicating any dimensional change equal to one-tenth of the tolerance involved.

Jaeger did it again...



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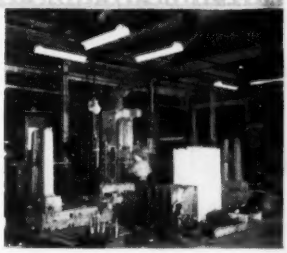

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SAMPLE OR SUB-GROUP NUMBER		1	2	3	4	5
DIMENSION AND TOLERANCES: .971± .001	SAMPLE READINGS OR MEASUREMENTS X	.9705	.971	.9716	.9705	.9705
		.9705	.9707	.9725	.972	.9716
		.9705	.9706	.971	.9705	.9714
		.971	.9703	.970	.9705	.972
		.9705	.9714	.971	.9708	.969
SUM OF SAMPLE READINGS		4.8530	4.8540	4.8561	4.8543	4.8545
AVERAGE of each Sample $\bar{X}$ (Plot on Chart)		.9706	.9708	.9712	.9708	.9709

Fig. 2—Method of charting data of 5-piece sample taken every half hour.

If the blueprint shows tolerances of ± .001 in., for instance, the indicating gage selected for the measurement should be directly readable to quarter thousandths (.00025 in.) if not to tenths (.0001 in.).

For the study, take samples of the output of the machine or operation usually not less often than every half hour nor ordinarily more often than every fifteen minutes. The pieces making up the sample are taken in order, succesively, as they drop from the machine and not at random from the work accumulated in between.

If the machine normally produces less than forty pieces an hour, take a 3-piece sample once an hour. Otherwise, use a 5-piece sample every half hour, except where the production rate is greater than 200 per hour in which event a 10-piece sample is sometimes required. Where the machine has spindles or stations, the half hourly sample size should then equal the number of spindles—as, 4, 6 or 8 pieces.

For this example, the 5-piece sample taken every half hour will be used and the action of the machine on diameter **A**, Figure 1, will be studied as typical of the machine's capability in holding to tolerances of ± .001 in. on an O.D.

Each successive piece as it comes from the machine is measured and the results of the five readings are tallied, added and averaged as illustrated in Column 1 of Figure 2. The gaging of 5 pieces plus recording the results is repeated half an hour later as Column

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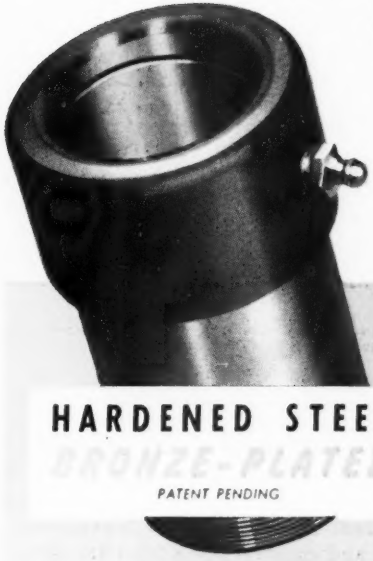

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Lamina Guide Bushings are made of hardened steel with .001" to .002" of bronze electro-plated on the inside diameter. In addition to this, an oil groove, 1/32" wide is machined into the inside wall in a figure eight pattern. Each bushing is furnished with an alemite fitting for lubrication of the oil groove.

In actual use on hundreds of Lamina-built dies, in laboratory tests under conditions far more severe than shop conditions, these bushings without exception have proven absolutely trouble-free in service.

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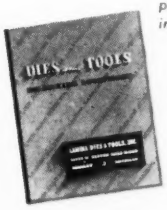

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SAMPLE OR SUB-GROUP NUMBER		1	2	3	4	5
DIMENSION AND TOLERANCES: .971±.001	SAMPLE READINGS OR MEASUREMENTS X	.9705	.971	.9716	.9705	.9705
		.9705	.9707	.9725	.972	.9716
		.9705	.9706	.971	.9705	.9714
		.971	.9703	.970	.9705	.972
		.9705	.9714	.971	.9708	.969
SUM OF SAMPLE READINGS		4.8350	4.8540	4.8561	4.8543	4.8545
AVERAGE of each Sample $\bar{X}$ (Plot on Chart)		.9706	.9708	.9712	.9708	.9709
LARGEST VALUE		.971	.9714	.9725	.972	.972
SMALLEST VALUE		.9705	.9703	.970	.9705	.969
RANGE of each Sample R (Plot on Chart)		.0005	.0011	.0025	.0015	.003

Fig. 3—Illustration showing the arithmetic method of finding the Averages, already illustrated in Fig. 2, and below them, the calculations of the individual ranges.

2 of Figure 2 shows. And so on.

Information like this presents the average diameter dimension the machine is producing periodically, a condition considerably under the operator's control of the setting. Such average figures and more like them will be used farther on in a chart which will be used to study the operator's manipulation of the machine.

While the less important calculation of "Averages" is proceeding, the other particularly pertinent calculation is made for each sample. This is the Range, so-called, a figure which displays the natural piece by piece diameter variation or the "spread" of the machine. To get the Range of each sample, select from each group the highest reading and the lowest reading and substract one from the other. The result each time is the Range for that sample. Figure 3 shows the arithmetic of finding the Averages, already illustrated in Figure 2, but, added below them, the calculations of the individual Ranges.

The samples from the machine are

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Deep Holes—Exclusively

.0001" in six inches

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The Rivett 608 will turn or bore within 0.0001" in six inches work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within a limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

PLUS every known attachment

A symbol of extreme accuracy, this Rivett 608 lathe is used in nearly every instrument and tool shop where fine exacting work is performed. A greater number of mechanical marvels have been developed on this lathe than on all other machine tools combined. The 608 is a small but exceedingly powerful back-geared, screw cutting engine lathe, with slide areas equal to those of other lathes twice its size. Finely-made attachments are available for milling, spiral-cutting, slotting, relieving, taper turning, radius turning, grinding, and forming. **Write for Bulletin 608F.**

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IT HOLDS

The Jacobs Manufacturing Co., West Hartford 10, Conn.

taken all day long usually. The statistical rule states that no conclusion should be reached on less than ten samples or sets of observations; usually more than twenty-five are unneeded. More important than the literal number of visits made to the machine is the fact that the samples are secured over a period of time where a typical or truly representative picture of the ordinary ups and downs of the machine's operation is secured.

For our example, ten visits were made to the machine producing around 70 pieces per hour of the type of part pictured in Figure 1 during a typical day. In each case the measurements on 5 successive pieces gave an Average and a Range, and the summaries of Averages and Ranges from the day's work are listed in the following chart.

Averages		Ranges	
.9706	.9716	.0005	.0012
.9708	.9704	.0011	.0007
.9712	.9709	.0025	.0028
.9708	.9701	.0015	.0012
.9709	.9713	.003	.0025

The next step is to figure the average Range (called $\overline{R}$, barred R) for the set of Ranges observed and computed for the day. This of course means add up the ten Ranges above and divide the sum by the figure ten. The result in this case is .0017 inch. Incidentally, while the arithmetic is proceeding, the average of the Averages above is figured for a Grand Average (symbollized statistically as $\overline{\overline{X}}$ or double-barred X), which turns out to be .9709 inch. The use of this latter statistic will be described farther on.

The formula for machine capability is $\frac{6\,\overline{R}}{d_2}$.

As just pointed out in the preceding paragraph, the $\overline{R}$ for the formula has

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been found. The factor, d_2, varies with the sample size, and statistical values for d_2 appear in the table below.

Sample size	3	4	5	6	8	10
Value of d_2	1.693	2.059	2.326	2.534	2.847	3.078

In our example a sample of 5 pieces was used in each instance Hence the d_2 factor to be used is 2.326. The $\overline{R}$ from our readings was .0017 inch. Putting these two values into the formula

$$\frac{6\,\overline{R}}{d_2}$$

, we get:

$$\frac{6 \times .0017 \text{ in.}}{2.326} = .0044 \text{ in.}$$

However, the blueprint shows tolerances of ± .001 in. or a tolerance spread of .002 in. for this particular O.D. (**A** in Figure 1). But the natural spread or capability of the machine, proven from measurements and the statistical system described, is no better than .0044 inch.

Though the operator on this machine holds assiduously to the mean, he is bound to get a percentage of oversize pieces, as well as undersize pieces, because of inherent characteristics of the machine. There is nothing he can do, as the machine stands, to prevent his getting some out-of-tolerance work.

To correct the machine so that its natural or inherent spread can be cut from .0044 in. to .002 in. may mean a simple adjustment the operator or toolsetter could attend to. Or it may mean an overhaul, even a new machine. Wear and looseness in bearings, spindles, chucks, collets, tool holders, cams and other fixtures are the usual causes to be looked for. Searching out the trouble sometimes is akin to the famous "blood, sweat and tears".

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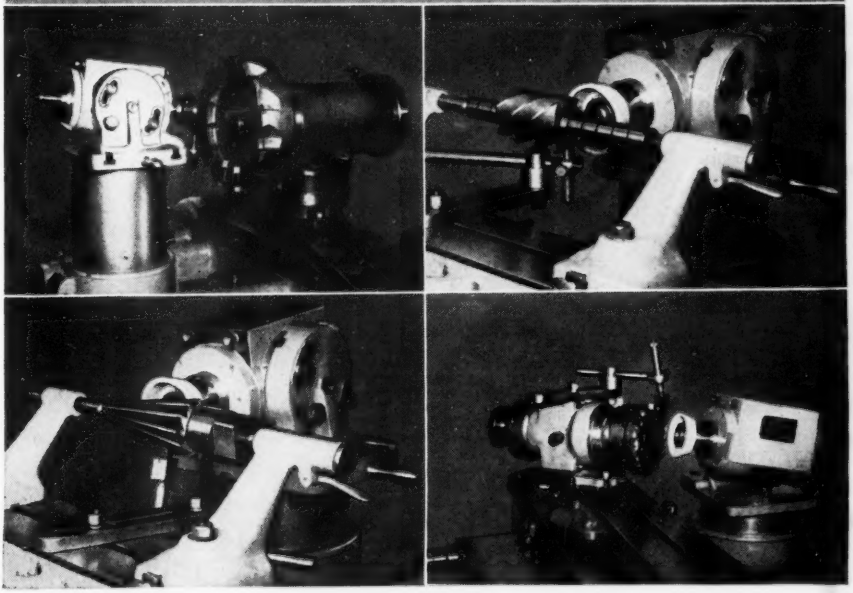

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Where mechanical corrections are not going to be simple, it may be well to reexamine the blueprint. If ± .001 in. tolerances are not really required, a change to ± .003 in. would relieve the rejection situation. Aside from repairing the machine or enlarging the tolerances, there are only two other alternatives left in a situation like this where a machine capable only of .0044 in. is trying to make pieces within .002 in. and those are 100 per cent sorting out of oversize and undersize pieces or shipping a percentage of junk on to the next operation, to assembly or to the customer.

Usually the investigation of a machine's capability is made more complete by studying a length dimension, like **B** in Figure 1, and an I.D. or bore, like **C** in Figure 1, with a set of at least 10 observations and similar calculations of $\overline{R}$'s for each dimension just exactly as dimension **A**, and O.D., was studied.

Most shops, too, proceed with the necessary overhauling of a machine, unless it is distinctly feasible to broaden the blueprint tolerances, until a satisfactory $\overline{R}$ can be secured. Some shops then post the capability of each machine, for O.D., length and I.D., either on the machine itself by means of a card, tag or label.

After overhauling steps have been taken, it is necessary of course to check the machine during a subsequent day's run to see that suitable $\overline{R}$'s are obtainable. The formula for the most economic value of $\overline{R}$ for the minimum tolerance required of the machine is:

$$R = \frac{.75\ T \times d_2}{6}$$

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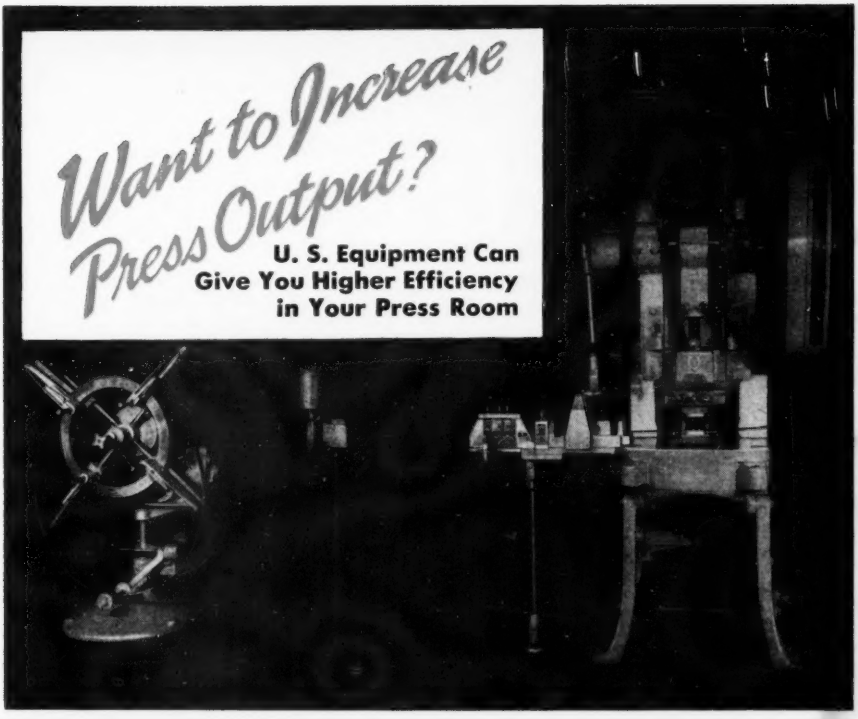

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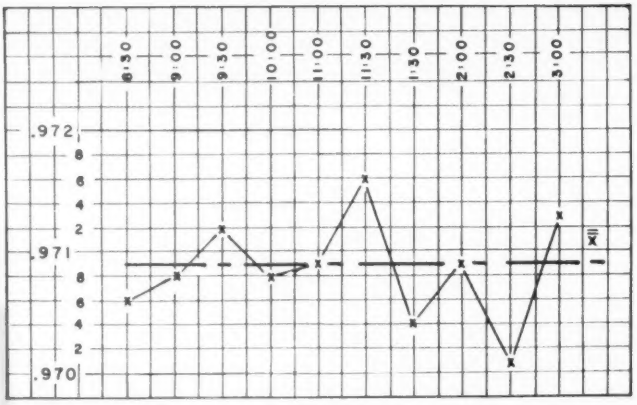

Fig. 4—Chart showing manner of plotting the Averages during the test run.

ample, with tolerances of ± .001 in., or a tolerance spread of .002 in., the formula above would compute out to $\overline{R} = .0006$ inch.

Coupled with a study of machine capability it is frequently pertinent to investigate the operator's grip on the job. Even though the machine has been put in trim, though a suitable $\overline{R}$ is delivered by it, the operator can still produce out-of-tolerance work, of course. An objective check on his know-how, cooperation, conscience and stability is useful. When we are sure the machine or process itself is intrinsically capable of meeting the specifications, however, half the battle of quality is won.

As described several paragraphs back, care was taken to observe the Averages during the test run and to compute the Grand Average. These should be charted and the result would look like Figure 4. The chart shows the $\overline{\overline{X}}$ value, the Grand Average of the day's work, and give a picture of the fluctuation of the work from one end of the tolerance spread to the other. Remember that the X's on the chart represent the average sizes of the samples and that individual pieces may vary as much as .002 in. either side of any average.

The statistical test of the habitual, uniform way the job is run and the tool settings are made, the Statistical test of an operator's "stability", can also be represented mathematically in the formula, $\overline{\overline{X}} \pm A_2\overline{R}$.

To use such a formula in the existing example, the value of $\overline{\overline{X}}$ has already

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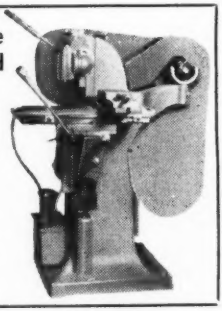

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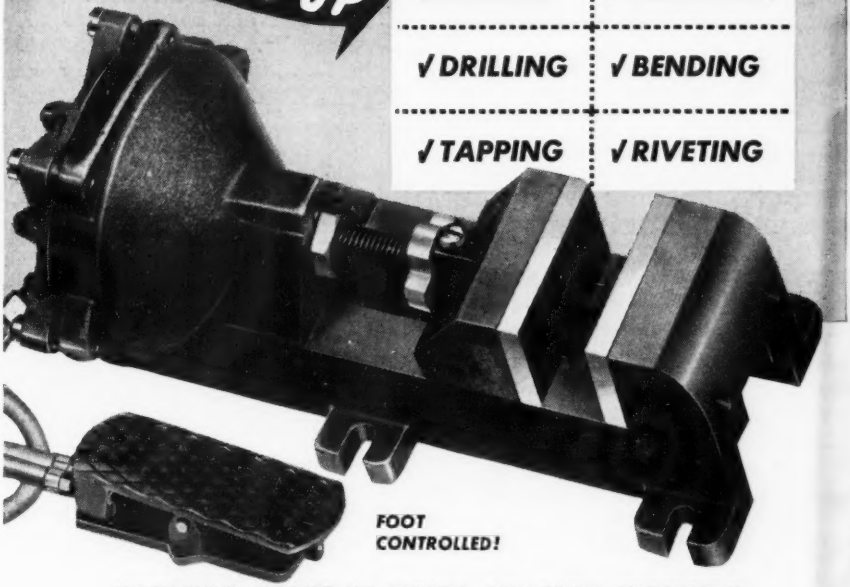

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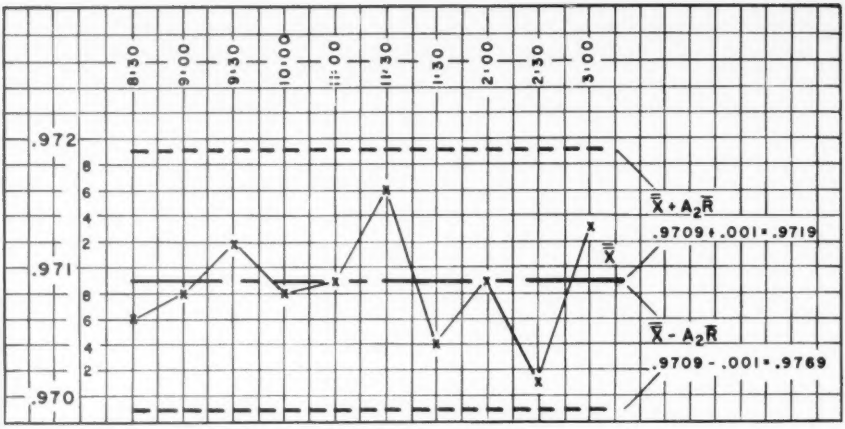


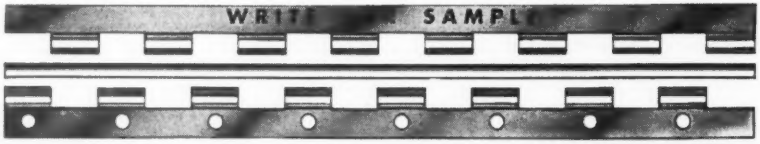
Fig. 5—Chart showing the plot of Fig. 4 with the so-called control lines added.

been determined, viz., .9709 in.; and also $\bar{R} = .0017$ inch. The values of the factor A_2 vary also with the sample size, like the d_2 values, as shown in the table below.

Sample Size					
3	4	5	6	8	10
Value of A_2—factor					
1.023	.729	.577	.483	.373	.308

Under ordinary operating conditions, then, the Averages, calculated from samples of 5 in the present example, should be expected to vary back and forth about the axis $\bar{\bar{X}}$, or .9709, between .9709 + .577 x .0017 or .9179 inch and .9709 — .577 x .0017 or .9699 inch. Such "controls" are better seen on a chart, and Figure 5 shows the plot of Figure 4 with the so-called control lines added. Since all the points on the chart come within the control lines, it is a sign that the operator did about the best he could with an erratic machine.

If the machine is overhauled so that its capability (its $\frac{6\,\bar{R}}{d_2}$) comes



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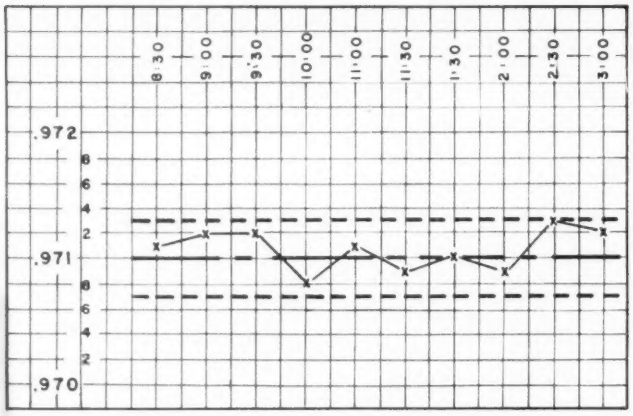

Fig. 6 — The narrow band for Averages variation as shown here indicates satisfactory operation.

down to the specification—to the tolerance spread of .002 in. and a $\overline{R}$ of .0006 in.—the chart limits for Averages would and should present a narrower band for Averages variation as illustrated in Figure 6. And if then the operator is on his toes, a plot like that shown in Figure 6 will ordinarily be obtained. Also, the day's work will very likely contain no more than ½ of 1 per cent out-of-tolerance work.

But if a chart of Averages like that in Figure 7 is obtained, the operator, for one reason or another, is not maintaining the machine's setting where it should be held. The first half of the chart indicates a uniform setting but entirely "high". Such operation would characteristically produce uniform work but most of it would be oversize. The balance of the chart points up oversetting—jumping from oversize work to undersize and back again, too much nagging the machine, or some other erratic condition.

It is probably now already apparent how a daily inspection and chart system can be applied to any machine which will help powerfully toward keeping the output of that machine within tolerances. Give an operator a machine and tooling well capable of maintaining tolerances and a chart to guide him, and there is little excuse for defective work and rejections, for scrap and rework, or for 100 per

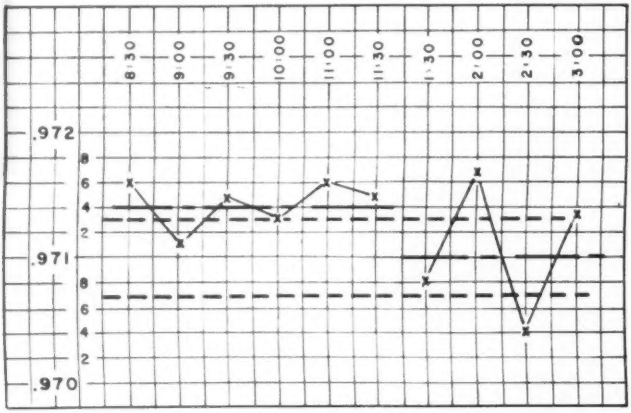

Fig. 7 — Plotting on the chart shown here indicates erratic operation.

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That which has been discussed and described up to this point pertains of course to one dimension only on a workpiece. It has been suggested that similar machine and operator capability studies be made on typical "length" and I.D. dimensions. Most machined pieces have, however, more than two or three dimensions to be controlled. To chart all the dimensions is unnecessarily burdensome. If one or two typical dimensions are charted, the rest, as has been said, usually fall in line. Then there are other workmanship difficulties like burrs, taper, tool marks, and surface finish which must be ordinarily watched for in order to prevent the rejection of goods.

For such a purpose a further "control" system can be added to the techniques described above and to the ordinary patrol inspection of such work. In addition to the sample taken directly from the machine for Ranges and Averages, enough additional pieces can be selected at random from the other work recently done to make up a total sample of ten pieces. These ten are examined on all other dimensions and for all other substandard effects. Any piece that does not measure up or match up to inspection standards is counted as a defective. It may be defective for one or for several reasons.

A little record is kept of the number of defectives found among the 10 piece sample, if any, at each inspection round and, at the end of ten inspection

** Incidentally, where daily process control charts are regularly used, the Ranges are also plotted. Because space is limited here, further details of the subject can be found adequately described in the Dimensional Quality Control Primer published by Federal Products Corp., 1144 Eddy St., Providence, R. I., or in the author's book, Quality Control Methods, Prentice-Hall, 70 Fifth Ave., New York.*

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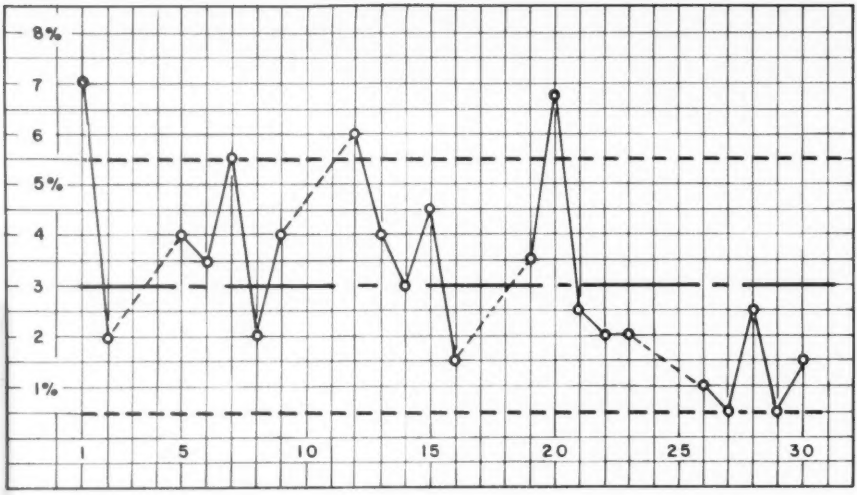

Fig. 8—Sample chart showing method of plotting daily percentages by the month.

"rounds" or visits to the machine, the results are summed up. Below is a three-day example of this type of inspection record.

Time	Sample	Defectives				
8:30	10	1	10	0	10	2
9:00	10	0	10	0	10	0
9:30	10	0	10	0	10	0
10:00	10	2	10	1	10	0
11:00	10	0	10	0	10	0
11:30	10	1	10	0	10	0
1:30	10	0	10	0	10	1
2:00	10	0	10	1	10	1
2:30	10	3	10	0	10	0
3:00	10	0	10	0	10	0
	100	7	100	2	100	4
Daily per cent defective		7%		2%		4%

As the above shows readily, the amount of defective, rejectable work the operation is putting out can be determined in terms of percentage. If the daily percentages are then plotted, by the month for instance, a chart somewhat like that illustrated in Figure 8 may be the result.

This chart shows graphically and instantly that during the month the operation produced an average of 3 per cent rejectable work. Some days it was 7 per cent, other days only 1 per cent. It is obvious that the quality is erratic; there are too many peaks and valleys in the chart. Even for a 3 per cent average, the job was not uniform at all. Three days in the month the percentages hit the upper "control" line or went beyond it. The chart, Figure 8, does show, however, that the operator got things in line during the last eight days of the month.

The sort of monthly chart such an operation as we have used for an example in this article ordinarily produces appears in Figure 9. Such a chart is usually the result in a situation where machine capabilities have been studied, where the machine and tooling have been overhauled, changed or suitably adjusted, and where the operator is following through with reasonably conscientious effort.

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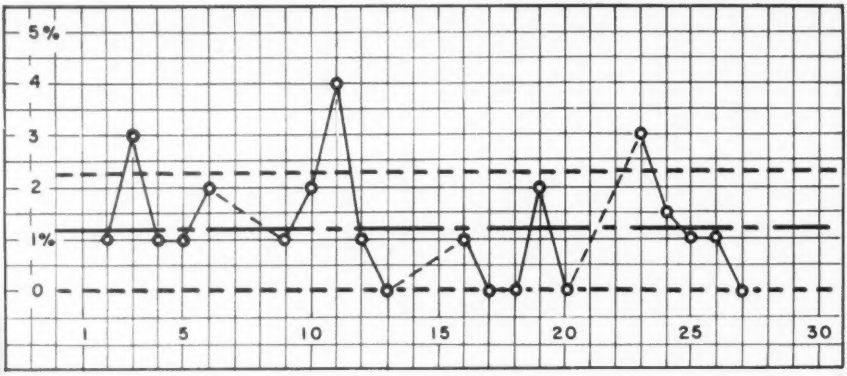

Fig. 9—Monthly chart of operation in which machine capabilities have been studied, machine and tooling have been overhauled, changed or suitably adjusted, and operator is following through with reasonably conscientious effort.

like those in Figures 8 and 9, it should be obvious from reasonable studies of the illustrations and the preceding discussion how to get the daily per cents defective and to plot them on a chart. The blank in the description is the matter of the upper control line. The formula for this is $\bar{p} + 3\sqrt{\frac{\bar{p}\,(1-\bar{p})}{500}}$, where $\bar{p}$ is the average percentage of defective work showing up on the daily reports during the month. In Figure 8 the $\bar{p}$ was 3 per cent, and, filling in 3 per cent or .03 in the above formula, we get 3 per cent + 2.25 per cent or the value of 5.25 per cent for the upper control line used in the chart of Figure 8. Similarly, in Figure 9, the month's percentages averaged out at 1 per cent and, using the formula above, the upper control located at 2.3 per cent.

The purpose of the upper control line in this type of charting is to show up the unusual, the abnormal, from the habitual way the operation is proceeding. Chart "pips" that jut up beyond the control line indicate days when something out of the ordinary disrupted the amount of out-of-tolerance work to be regularly expected from the machine. To the supervisor a chart pip

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should be a signal to specially investigate what happened.

It is to be remembered that the quality of the work is being estimated from samples of it. Hence, where a day's percentage, calculated on the basis of a sample, falls under the control line, the chances are in the order of 99 per cent good that the total amount of work completed, over and above what was seen in the sample, came out pretty close to the month's average percentage of defectiveness.

A "poor" chart of course points to the work that should be segregated from the rest to be sorted, reworked or scrapped, depending on which is the less costly alternative.

The study of machine or process capability and the use thereafter of the necessary daily control charts can be readily, gradually, spread through a department and the whole shop. Such action usually takes no more time nor involves no more expense than the existing and perhaps ineffective inspection system. Best of all, if the goods represented by satisfactory charts are presented to, say, Government inspectors, there is small liklihood of rejection.

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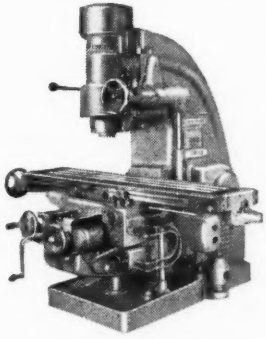

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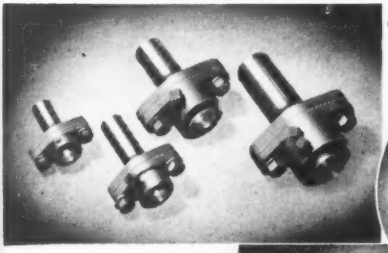

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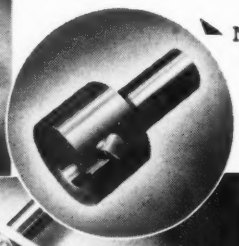

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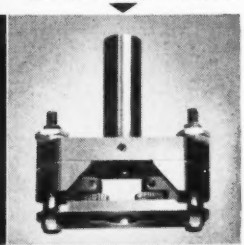

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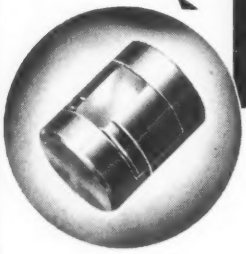

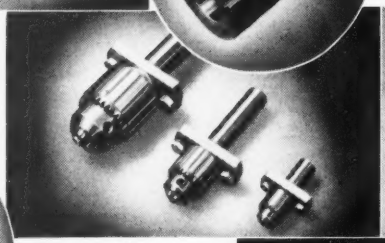

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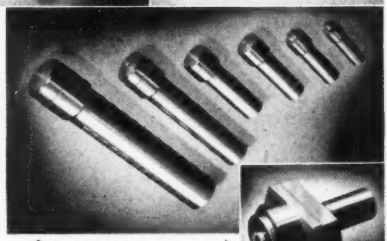

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The Right Tool For The Job

By J. T. Lancaster

In which the author describes the construction and application of several time-saving jigs and fixtures.

AT the start, we may say that a tool is "right" if, with it, a satisfactory workpiece is produced at the lowest possible cost and with the greatest amount of safety to the operator.

In the development of a new product, especially, the amount of money allocated for development, materials, methods, and tools is dependent upon the estimate of probable sales; and after a tentative working budget is announced, plans are made in the various departments in order to obtain optimum efficiency.

As in the other departments, the new product is studied carefully in the tool department. The chief tool engineer receives the job specifications, considers the various methods of economical production, and, perhaps with a suggestion of two, delegates the actual planning to one of the men working with him. In this respect, the man who usually does the best job of planning is the one who understands the practical aspects of machining, time study methods, and production control. Experience in these fields, combined with designing ability, helps a man in his efforts to consider all possible phases in the development of a new product.

Often, after the initial stages of planning are completed, conferences are called so that suggestions for improvement may be heard; and, subsequently, the suggestions which are approved are incorporated into the original design. If at all possible, the actual reason or reasons for the rejection of an impractical suggestion should be made clear to the suggestor so that he does not become dissatisfied

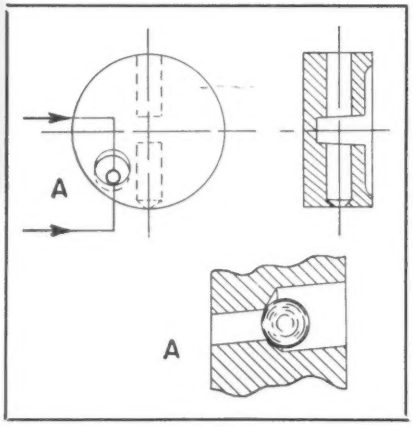

Fig. 1—Drawing of small plunger.

Fig. 2—Illustration showing in open position the small jig designed for seating ball.

and/or disgruntled. In many cases, it is more difficult to explain the rejection of a practical idea. As is often the situation, a number of fine ideas may be heard at a suggestion conference, and it is just impossible to incorporate all of them into an individual design. Since each man thinks that his idea is the best one, a considerable amount of tact must be used in justifying the reasons for the ideas selected.

Ball Seating Jig

A section of a small plunger, which is produced as a production item, is shown in the drawing, Fig. 1. Note the valve hole at **A.** On assembly, a grade A ball, which acts as a stopper, is inserted in this hole, a brass wire being used to prevent the ball from dropping out. The holes in these plungers are jig drilled; and, as may be seen, the holes are drilled at an angle in order to permit the balls to roll, rather than fall, into position.

For some time, it was not realized that very tiny irregularities in the valve seating, not visible to the naked eye, were allowing liquid to get by. To correct this situation, the writer included a ball seating operation which gave very satisfactory results. A grade A ball was inserted into the valve hole; and then, using a short rod and a hammer, the ball was tapped smartly. This simple tapping procedure produced a perfect seat and permitted the same ball to be left in place for use.

The illustrations Figs. 2 and 3, show the small jig, in an open and closed position, which was made for use in the seating operation. Sample plungers are shown at the right, and a ball and rod are shown in the foreground. Details of the jig are shown in Fig. 4. The jig is made slightly off perpendicular so that the rod will follow the angle of the valve seating hole; and, as may be seen, perfect freedom of handling is permissable.

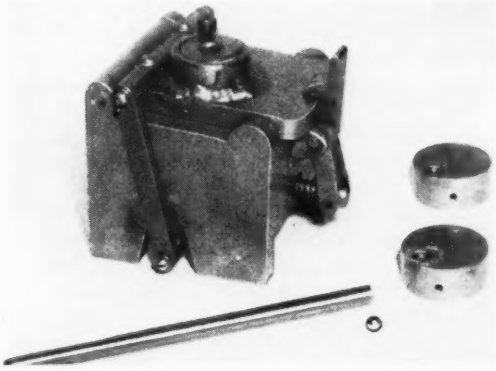

Fig. 3 — Illustration showing in closed position the small jig designed for seating ball.

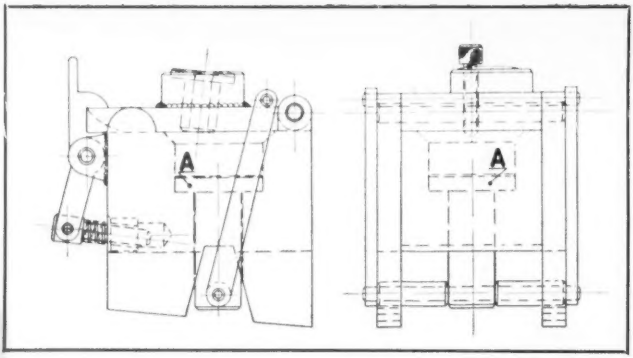

Fig. 4—Detail drawing of jig shown in Figs. 2 and 3.

In operation, a plunger is inserted in the hole at the top of the jig; and, when the leaf of the jig is pulled down and held in place by a latching mechanism, the plunger automatically drops down and settles on a solid base, **A**, Fig. 4. The part is thus held firmly for the seating operation, and the operator proceeds to insert a ball and tap it with the short rod.

After the jig had been in operation for some time, it was suggested that a simpler jig could have been made and that "the drill jig could be used". Adhering to the policy of considering all suggestions, the writer first obtained the reactions of the operator who had been using the jig. The operator said that he "liked it" and was "quite satisfied". Two different operators were then tried out on the job, each working with two sizes of plungers and using both the old drill jigs and the new seating jigs. The following comparative results were obtained:

	Average time required for the operation, seconds
1½ inch diameter plunger, using old drill jig	10.01
1½ inch diameter plunger, using new seating jig	7.85
1⅝ inch diameter plunger, using old drill jig	12.50
1⅝ inch diameter plunger, using new seating jig	6.86

More than a hundred pieces were used for each test, and the results were conclusively in favor of the new seating device. The suggestor had overlooked the fact that the drill jig had to be turned over in order to get the piece out, and that the turning over operation required time.

Fixture for a Rectangular Box

A relatively small number of rectangular boxes, such as the one shown in Figs. 5 and 6, were to be fabricated from 12 gauge stock to approximately the following dimensions, 5⅝ inches wide x 16¾ inches long x 3⅞ inches high; and, because of the small quantity being made, the cost of auxiliary tools had to be kept down. About the most important operation in fabricating these boxes was the welding of the corner posts into position.

After consideration, it was felt that, first, the pieces which formed the box, a long formed center channel and two end pieces, should be held in position in a fixture and the pieces tack welded to form the box. The box was then to be pulled out of the fixture; two posts were to be placed in the box at diagonal corners and positioned positively with a post holding tool; and the two posts were to be tack welded. The other posts were to be tacked in the same manner; and then, the whole case, complete with four posts, was to

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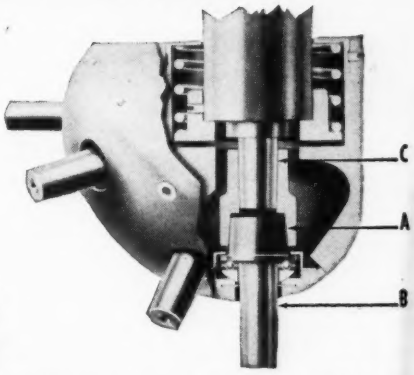

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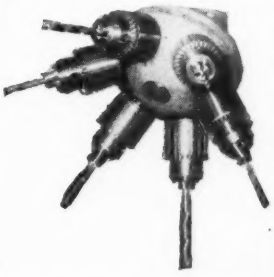

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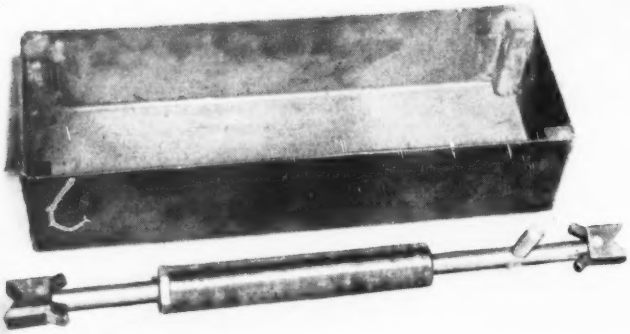

Fig. 5 — Illustration showing welded rectangular box with posts in place at each corner. Post holding tool is shown in foreground.

be fully welded.

The fixture and the post holding tool which were designed are detailed in Figs. 7 and 8. The tool attachment may be seen with a box in the illustrations, Figs. 5 and 6. The reason for using this method instead of positioning the posts at the same time that the box parts were tacked was that, if the posts were tacked in position with the case proper, a considerable amount of difficulty might be encountered in pulling the box out of the fixture.

When the fixture and holding tool reached the shop, a suggestion was made by one of the operators, "why couldn't the posts be put in at the same time that the case proper is tacked?" It was explained by the writer that the backing plates would have to be made

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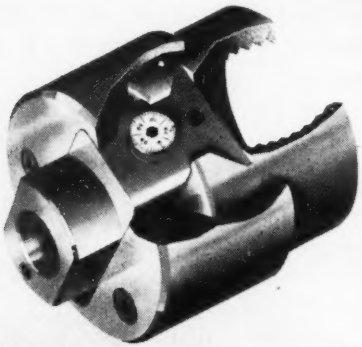

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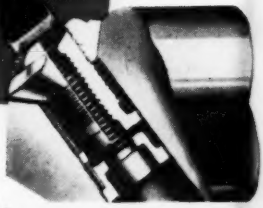

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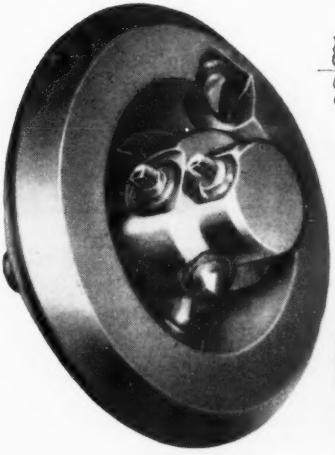

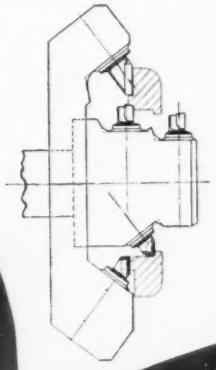

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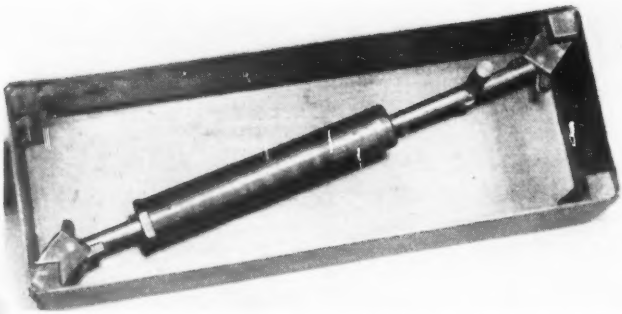

Fig. 6—View of rectangular box with post holding tool in position.

so that they could be eased out of the way after the welding was completed, thus increasing the cost of the fixture. The suggestor, however, still felt that angle plates could be added to the fixture and that the posts could be positioned in the angle spaces and the box then welded as one unit.

In view of his persistence and the small cost involved in adding the angle plates, it was decided to try out the man's idea. Two angles were added, as shown at **A**, Fig. 7, the other side remaining as it was, as shown at **B**. As soon as this fixture reached the welder, he complained. It was found that by adding the angle plates and welding as suggested, the job was slowed up and the operator had much difficulty in taking the parts out of the fixture.

Tests were then conducted to compare the two methods. Before the ac-

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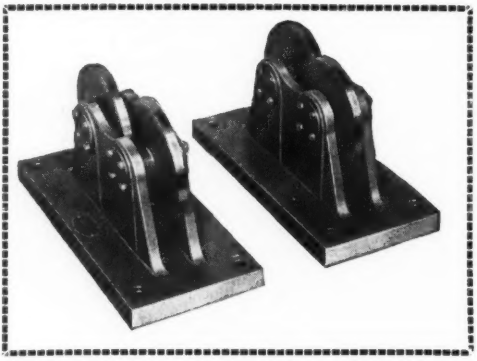

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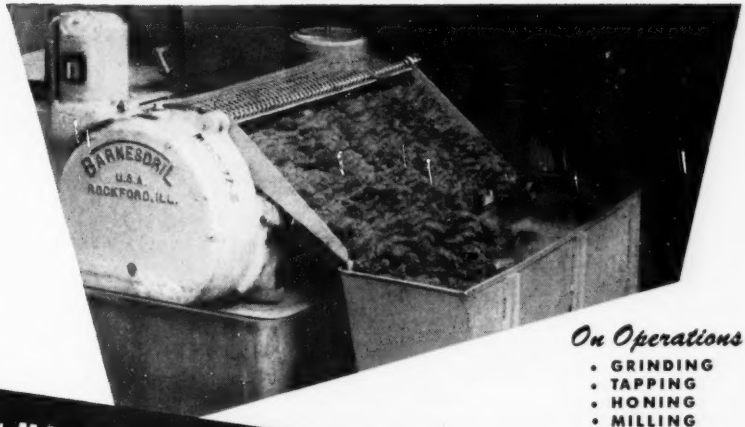

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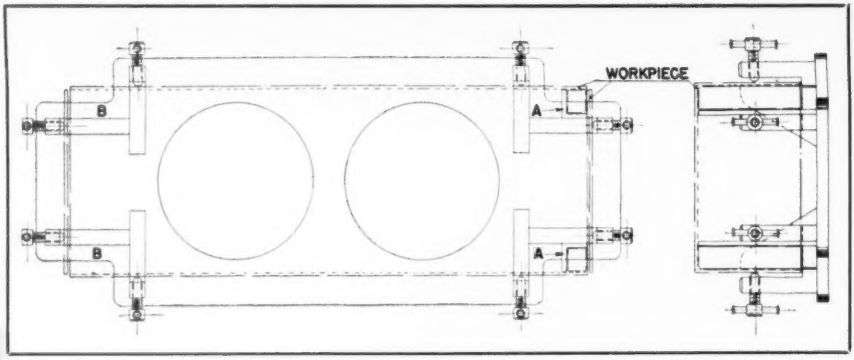

Fig. 7—Drawing of fixture designed for rectangular box.

tual time checks were taken, the welder was allowed to make a few of the boxes using each method in order to acquaint him with the two methods and to permit as fair a test as possible.

The average time required to complete a box using the suggested method, with the angles in the fixture, was 8 minutes and 1 second. The average time required using the original method was 6 minutes and 18 seconds. By subtracting, a time difference of 1 minute and 18 seconds was obtained; and it is significant to note that the greatest part of this difference was made up of the time required to remove the box from the fixture. With the suggested method, the removal time averaged 58 seconds, with the original method, 9 seconds—a difference of 49 seconds. The time differentials proved conclusively that the original method was the better one. However, the writer was careful to give the suggestion a fair trial; there is always opportunity for improvement.

Case Fixture for Facing and Drilling

A cast iron, irregularly shaped case having tapered sides is shown in Fig. 9. The dimensions of the case are approximately 16 x 5¼ x 3⅜ inches. Two ¼ inch dowel holes are drilled in the top of the case, one at each end; and fourteen other holes are drilled in the top of the case at various intervals around the sides. These fourteen holes are later tapped to take ¼ inch stand-

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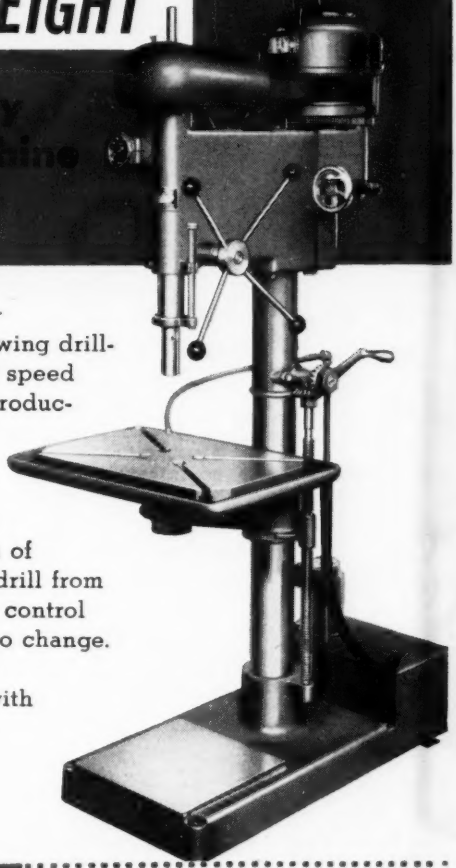

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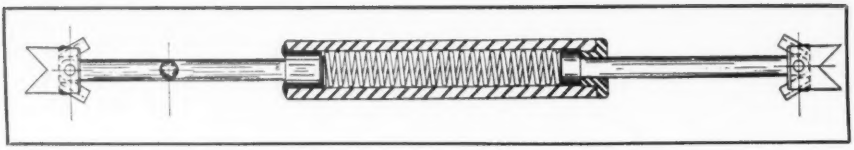

Fig. 8—Detail drawing of post holding tool.

ard flat head screws. Similarly, two holes are drilled and tapped in pads at the bottom of the case to take ¼ inch screws. Three bosses, ⅜ inch high, **A, B,** and **C,** Fig. 10, project upward from the inside bottom base of the case. Boss **A** is reamed to 1.406 inches, and bosses **B** and **C** are reamed to .750 inch; the three holes are each ⅛ inch deep.

All of the holes must be located perfectly since, at final assembly, a plate is fastened and sealed in place on top of the case. This, in turn, means that the top of the case must be perfectly smooth. Due to design and casting difficulties, no pads could be built onto the sides of the case for hold down purposes; and so, on studying the situation, it was felt that a fixture such as the one shown in Fig. 9 and detailed in Fig. 10 would be satisfactory for facing off both the top and bottom surfaces.

The fixture is of tubular welded construction. Slots are provided in projections at each for attachment to a milling machine table, and a centralizing bar is provided at **D.** Five angular ⅜ inch conical end screws are used to hold the case in place during machining. The ends of the case are first straightened off on a large vertical

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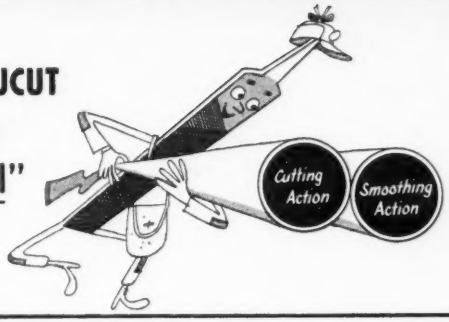

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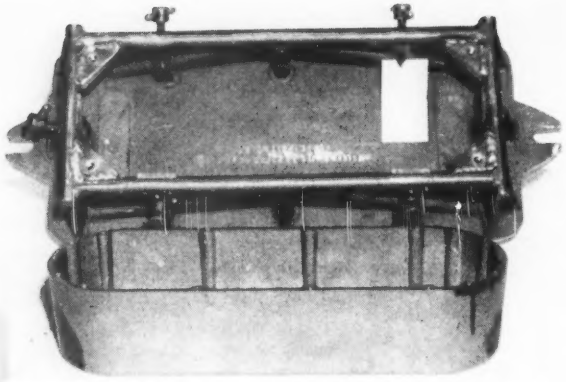

Fig. 9 — View of cast iron irregularly shaped case and fixture for the case in background.

mill; and then the case is placed in the fixture right-side-up, and the top surface is faced off. The case is located on three location pads which are indicated at **E, F,** and **G** in Fig. 10. The facing operations are completed in approximately six minutes or less.

A special drilling plate, which is placed on top of the fixture shown in Figs. 9 and 10, is used for drilling the 21 required holes. The plate is detailed in Fig. 11; and, as may be seen, long drill bushings are used for drilling the holes in the bottom of the case. In operation, after a case has been faced, the special plate is placed on top of the fixture and securely fastened down with four screws through holes indicated as **A, B, C,** and **D,** Fig. 11. The fixture and plate, as assembled are

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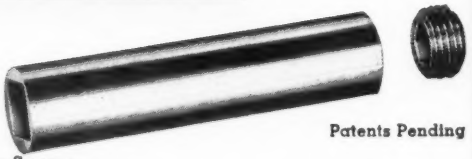

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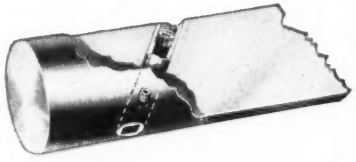

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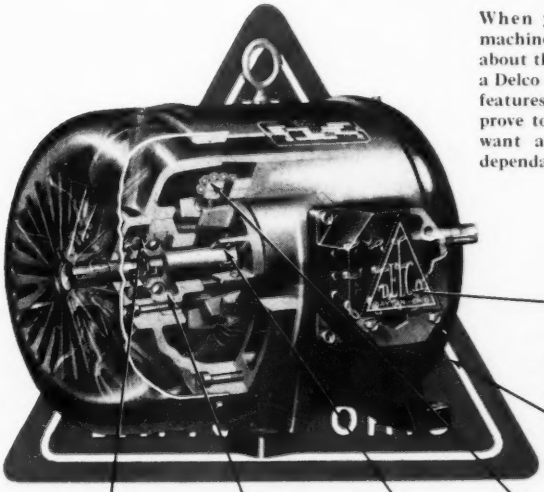

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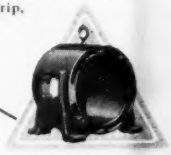

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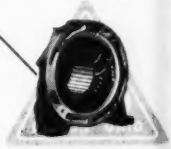

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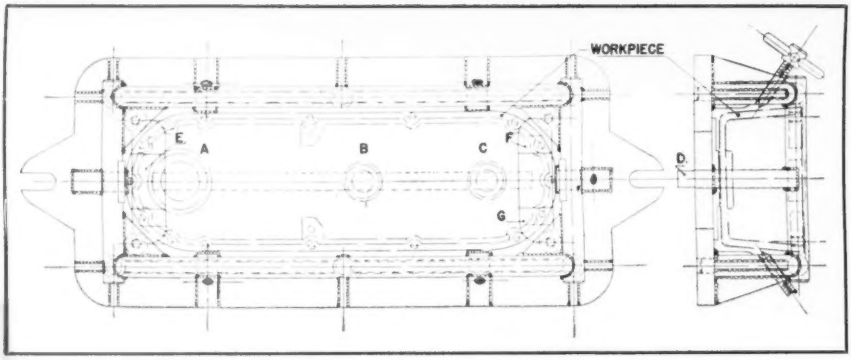

Fig. 10—Detail drawing of fixture designed for holding irregularly shaped case.

shown in Fig. 12.

One point which should be mentioned is that the case thickness of the castings varies as much as plus or minus $\frac{1}{8}$ inch from the established dimension; and, since the walls of the cases are not too thick to begin with, any variation in thickness must be watched carefully so that the $\frac{1}{4}$ inch holes do not break through the edges of the cases. Of course, the best results would be obtained if all of the cases were identical in thickness. However, since this is not the situation, a simple method is provided to adjust for different case thicknesses.

Four inspection slots, indicated in Fig. 11 at **E, F, G,** and **H,** are cut in the special drill plate so that the operator may see the top of the case. By adjusting the conical screws in the fixture, the case may be centered and adjusted for thickness so that the holes will be drilled properly. The two long screws, which are indicated at **I** and **J** in Fig. 11, are used to help keep the case well seated on the three location pads, **E, F,** and **G,** Fig. 10. A case may be completed—loaded, drilled, and unloaded—in approximately ten minutes.

Fixture for Small Lot Production

Nothing sensational or unusual is claimed for the fixture shown in Fig. 13 except that it lends itself to small lot production. The fixture was made to be used in a lathe for boring the

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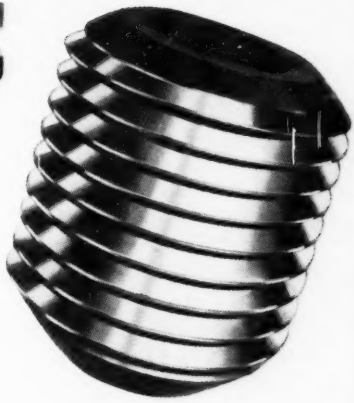

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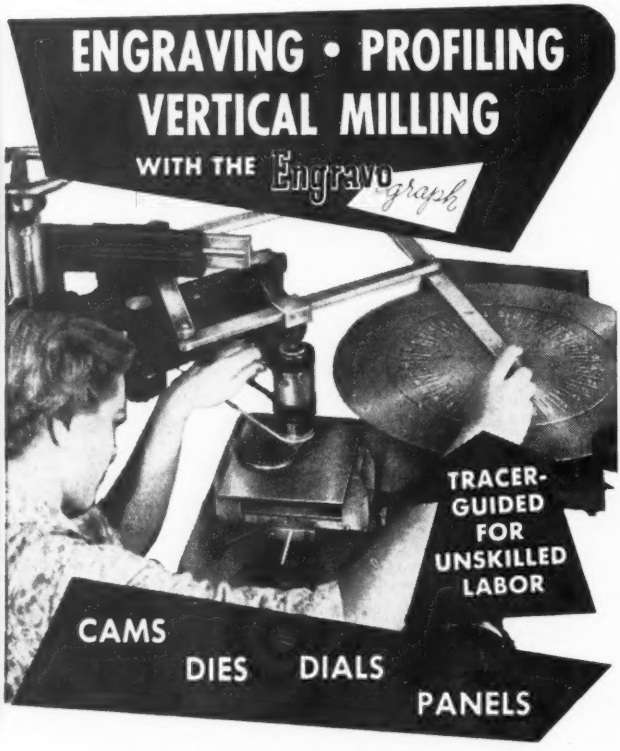
large holes in the workpiece shown at the right in Fig. 13. Before the parts are placed in the boring fixture, the top and bottom surfaces are squared and the holes in the four lugs are drilled. The holes in the lugs are then used to locate the parts for the boring operations.

The fixture is shown in detail in Fig. 14; and, as may be seen, the design is quite simple. The plug marked **B** is fastened securely to the main plate of the fixture, **E**, and is used to hold the fixture in the headstock of a lathe. A pin, **C**, which is fitted into a slot in the faceplate of the lathe, is provided as an extra safeguard for driving the fixture. Three holes, which are shown at **A**, are drilled in plate **E** for attachment of plates for balancing purposes.

Platform **D** is fastened solidly to plate **E**, and this platform is used to locate the part when the larger of the two holes is bored. Platform **F** is a detachable plate and this platform is attached to the main plate, **E**, by means of screws and dowels when the smaller hole is bored. The reason for having two platforms is accounted for by the difference between centers of the holes being bored.

Each piece is held down securely in the fixture by means of slotted pivot levers which can be seen clearly in Fig. 13 and also at **G**, Fig. 14. These levers are placed on the lugs in order



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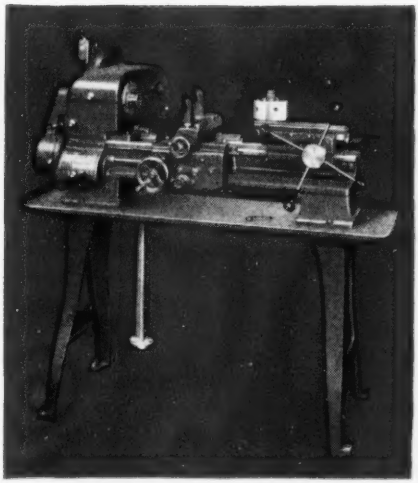

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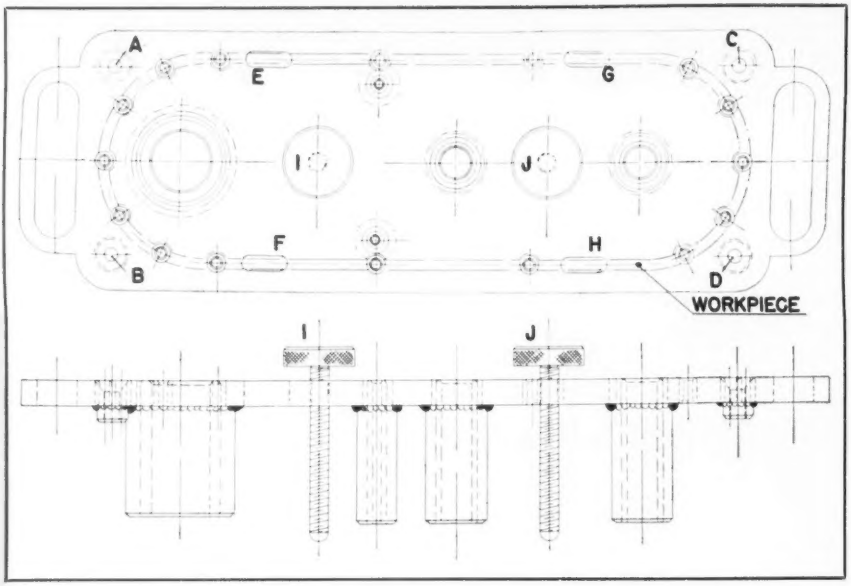
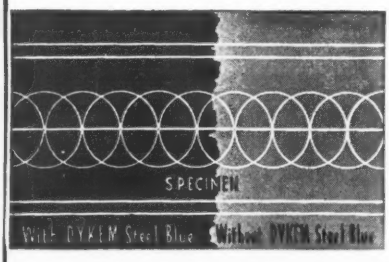


Fig. 11—Detail drawing of special drilling plate.

to hold the workpiece. The time required to place a piece in the fixture and secure it in place is less than one-half minute.

The writer believes that one good piece of advice is that the designer should be careful of becoming a stereotype. He should not stick to his pet ideas for every job unless he is certain that these ideas are apropos of the situation. And he should remember that a method which is highly satisfactory in one plant may not be at all suitable in another plant. The evident is too often bypassed because of a designer's fixed ideas.

And too, although books serve as fine reference material for various jobs, we should learn not to depend entirely upon them. After a long period of copying, adjusting, and/or altering, a designer may find that his



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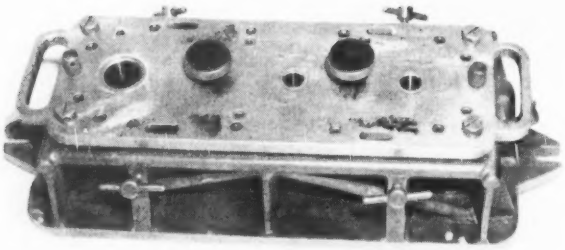

Fig. 12—View of assembled fixture with special drilling plate in position.

gift of original thinking and design has left him.

False Economy

It does not seem logical that a designer should spend a great deal of time in designing tools which might save seconds in machining when the castings for which the tools are being designed are received in the shop in such a poor condition that minutes must be spent in grinding good location spots. This situation is more certain to arise in shops which continue to use wooden patterns, with their attendant faults.

Also, warped castings do not lose their warped condition during machining; and even though the casting may be made to fit into the jigs and fixtures, the result is usually a second-rate looking job. A simple gage and/or a quick crack with a hammer is many times sufficient to straighten workpieces, and many hours may be saved. Quality sells itself; and one can be assured that if a man looks to good appearance, good fit, good performance, and a minimum amount of maintenance, he will insist on first-rate parts for every job.

Some companies still cannot see the advantages of having "rough parts receivable" inspectors. An operator is not an inspector, and he is not hired to be one. In most instances, he is not interested in searching for blow holes, core shifts, and the like; and so he may finish a dozen or more pieces in a day and, when finished, find that the parts have to be scraped for casting or forging faults. On the other hand, an inspector is able to look over many hundreds of parts in a day. The profit and loss factors are obvious.

One other piece of false economy which should be mentioned is that, in many plants, a number of parts are "laid out" because no jigs or fixtures are made for the jobs. The writer does

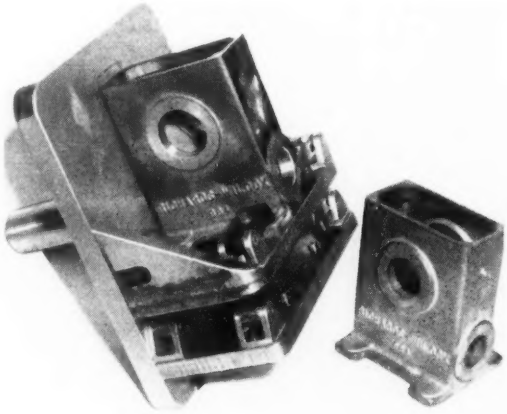

Fig. 13—The fixture shown at the left was designed for use in a lathe when boring the large holes in the workpiece shown at the right.

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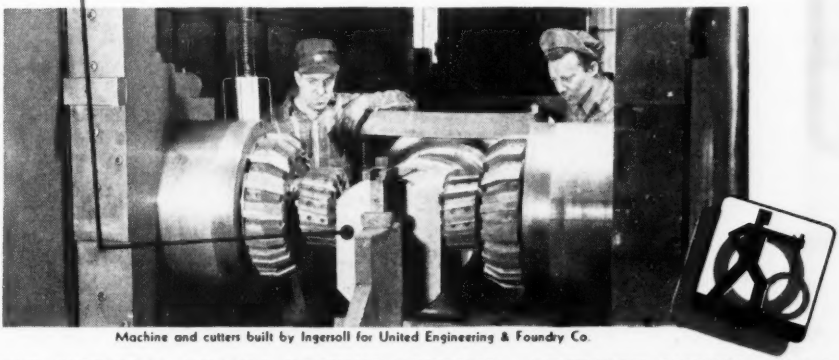

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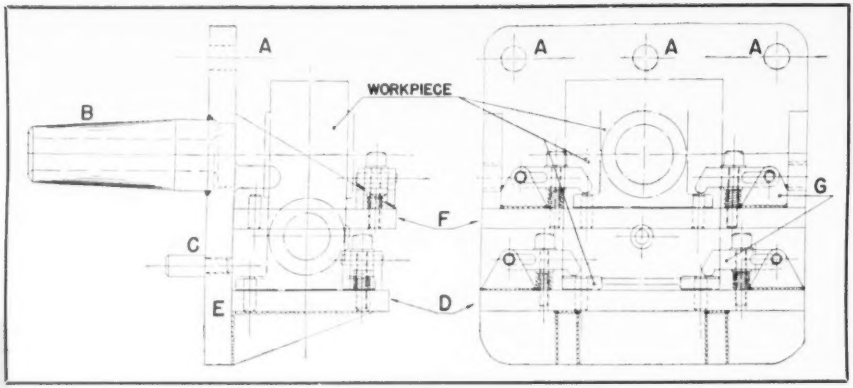

Fig. 14—Detail drawing of fixture shown in Fig. 13.

not mean that one should try to make every machine shop into a tool room or a development department. But, it may be said that there are few cases where the practice of "laying out" is justified. Even when there are only about fifty parts being made, if each part has one or more holes drilled in it, the investment in a simple jig or fixture may seem uncalled for, the cost is usually absorbed in the advantages of relieving a machine more quickly, assuring proper hole alignment in all parts, and in eliminating individual setting of each part by the operator.

We all know that minutes lost can never be reclaimed. It is the pieces which could have been produced in the lost time which are the actual loss.

Industrial Training Films

Two new 10-minute 16 mm. sound films have been announced by Utica Drop Forge & Tool Corp., 2415 Whitesboro, Utica, N. Y. They are offered to industry as aids for training programs to show workers the making of good hand tools, how to use them for best results, how to care for them for long usefulness, and how to make simple, practical repairs on the tools.

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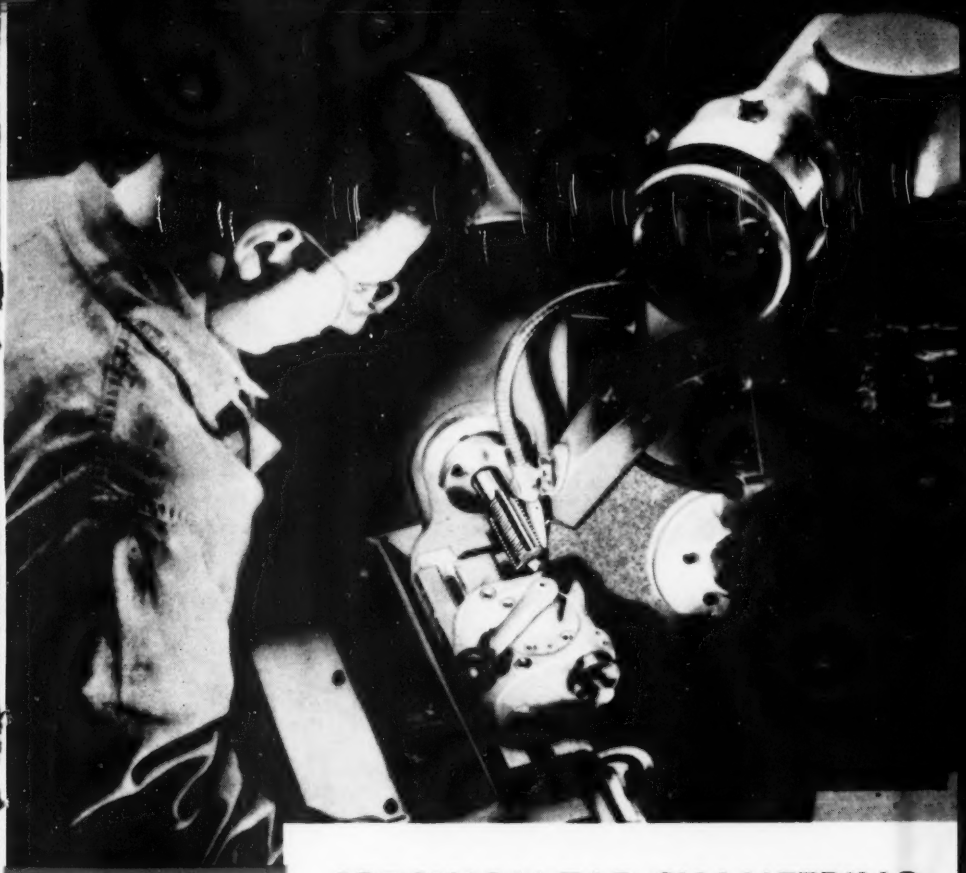
The two films, which are so arranged that each is complete in itself, are being offered free (except for return shipping cost) to factories and industrial organizations, as well as to schools, clubs, trade associations, churches, and other interested groups.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.



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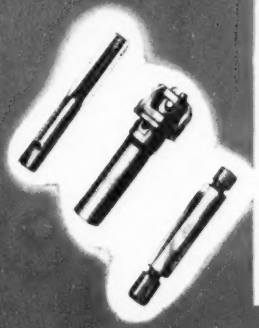

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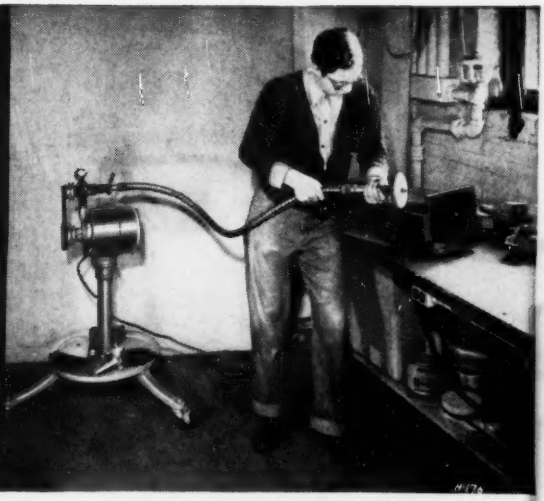

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FLEXIBLE SHAFT EQUIPMENT

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Designing Drawing And Redrawing Dies

The author presents formulas and other helpful data for designing and operating drawing and redrawing dies.

By C. W. HINMAN

Designing Engineer

A WELL known axiom tells us that when computing any size or shape of shell that the area of a finished shell and the area of its blank are equal if no change occurs in the wall thickness while drawing or when no ironing is done. In other words, the diameter of a circular shell is the given diameter minus its wall thickness. Therefore, computations for all shapes of shells are made from the center lines of the shell walls.

Another axiom has it that circular shells must necessarily have circular blanks that are considerably larger than the shell, and that rectangular or irregularly shaped shells have a blank whose size is considerably larger but whose shape is similar to that of the finished shell.

Standard handbooks and textbooks on dies usually give us considerable information about necessary blank sizes and the difficulties encountered when drawing shells. For example, Figs. 1 to 12 are samples of circular shells taken from the author's book, "Pressworking of Metals," Second Edition, published by the McGraw-Hill Book Co., Inc., New York 18, New York.

Formulas of blank sizes for all circular shells are based on the simple formula for a straight, square cornered shell, as shown in Fig. 1, and which is $D=\sqrt{d^2+4dh}$, in which **D** is the blank diameter, **d** the shell diameter, and **h** the shell height. However, a square cornered round shell is not readily drawn without using a die of special design. The bottom of the shell would tear out or the corners would rupture. However, a circular square cornered shell is the basic design given for computing other shapes of round shells and for estimating purposes.

The derived formulas given under each circular shell in Figs. 1 to 12 show us how such formulas can be mathematically worked out and the correct formulas given. Many other similar formulas can be found in text-

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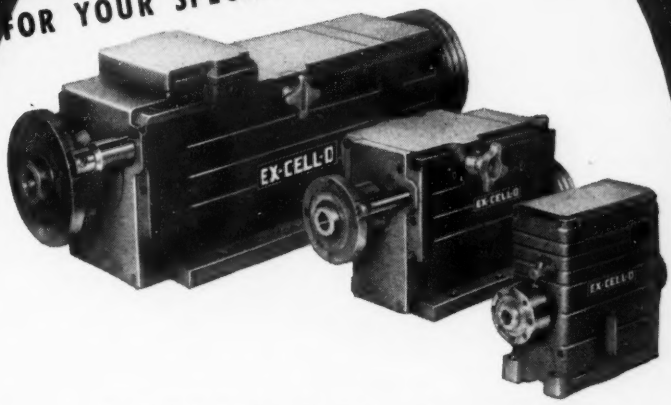

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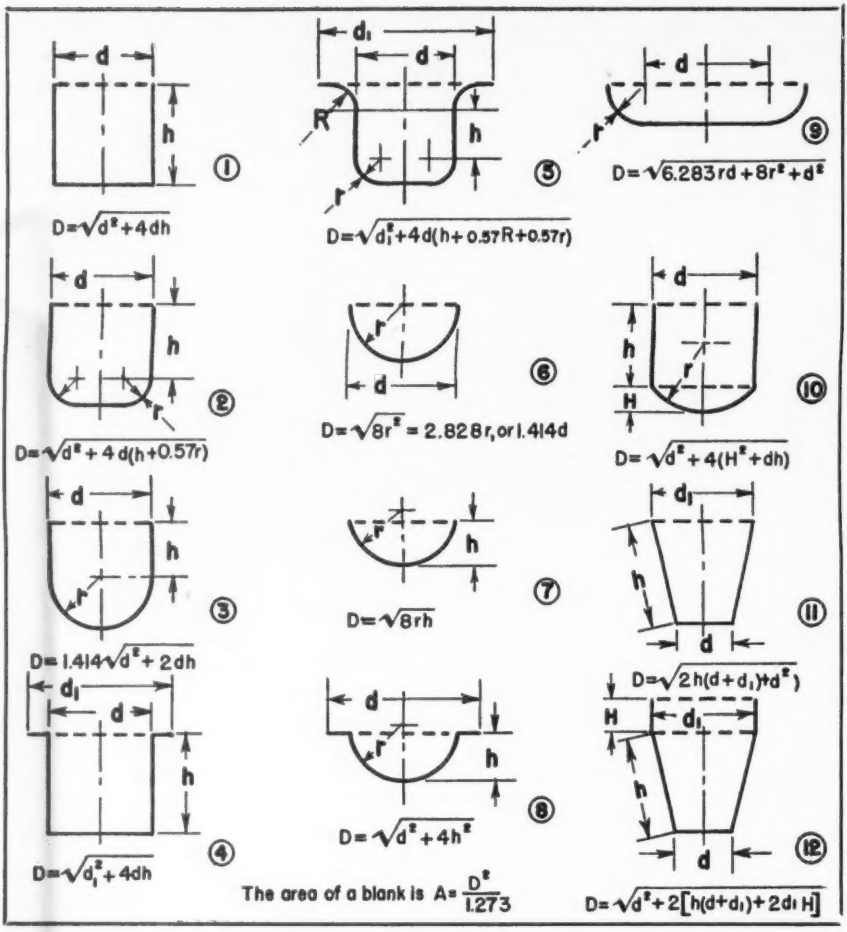


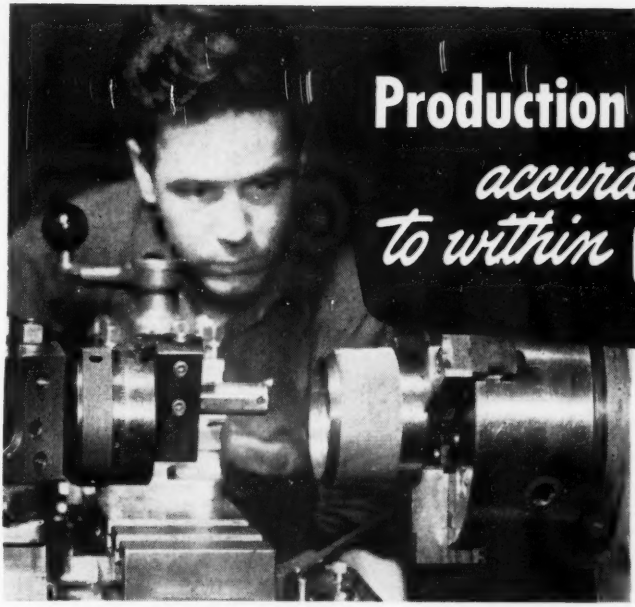
Figs. 1 to 12—The formula shown beneath each shell is recommended for use in determining the size of blank required for the shell.

books on dies. Any tool engineer who is mathematically inclined can derive his own formulas for the blank size of any shape of shell.

Blanks for Rectangular Shells

In Fig. 13, **F**=**B** minus 2**r**. **G**=**C** minus 2**r**. **H**=**E** minus **r**, and the entire area of the shell is: $\mathbf{A}=2\mathbf{H}(\mathbf{F}+\mathbf{G})+\mathbf{GF}+6.283\mathbf{r}\frac{(\mathbf{F}+\mathbf{G}+\mathbf{H})}{2}+6.283\mathbf{r}^2$.

Having the area of a rectangular shell, by adding metal for trimming and then opening the shell flat and supplying the dimensions, we have the problem solved.



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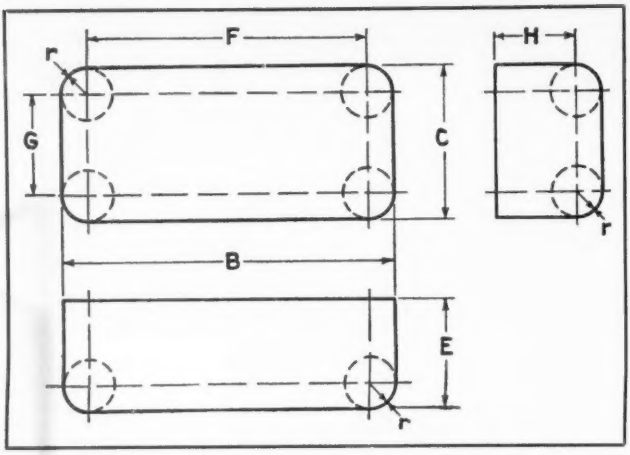

Fig. 13 — Illustration showing method of developing the area and blank for a rectangular shell having round corners of equal radii.

It is interesting to note in Fig. 13 that at the four corners of the shell we have a straight round shell with a hemispherical bottom and that a formula for this shell blank is given in Fig. 3. Further note that only one-quarter of the shell is used at each corner, and that the radius of its blank determines the rounded corners for the blank in Fig. 13. In a rectangular shell like that shown in Fig. 13, all of the drawing occurs at the four corners of the shell. The sides and ends are simply formed up.

Other Questions

Is the work material drawable? For steel, S.A.E. 1010 is best for drawing, but harder grades of steel should have shallower draws and longer radii in the punch and die. In shops without a hardness tester, if a sample of the metal can be twisted or bent over upon itself flat down 180 degrees without showing cracks or ruptures, it is of sufficient ductility to draw shells.

In the nonferrous metals, soft cop-

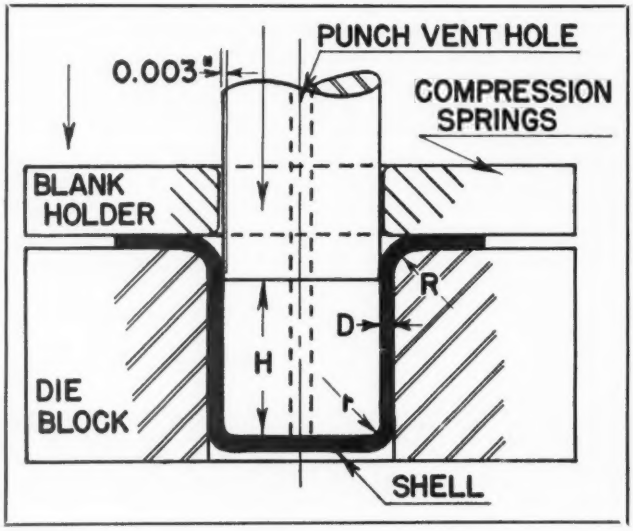

Fig. 14 — Drawing showing setup in which special drawing punch is used.

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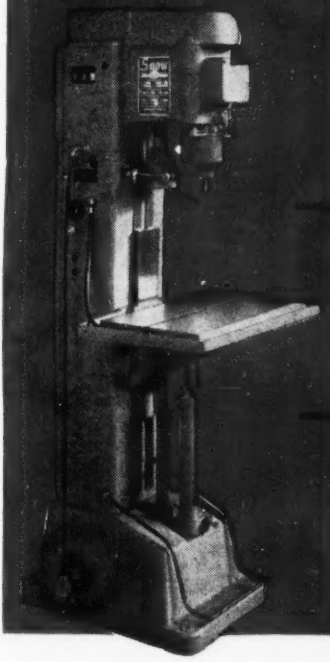

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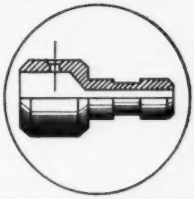

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Tap Two #10-32 Holes

Material—Steel stamping
Production—3800 tapped holes per hour
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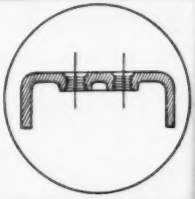

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Material—Die Cast Aluminum
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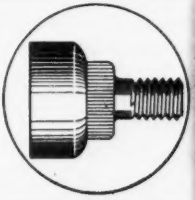

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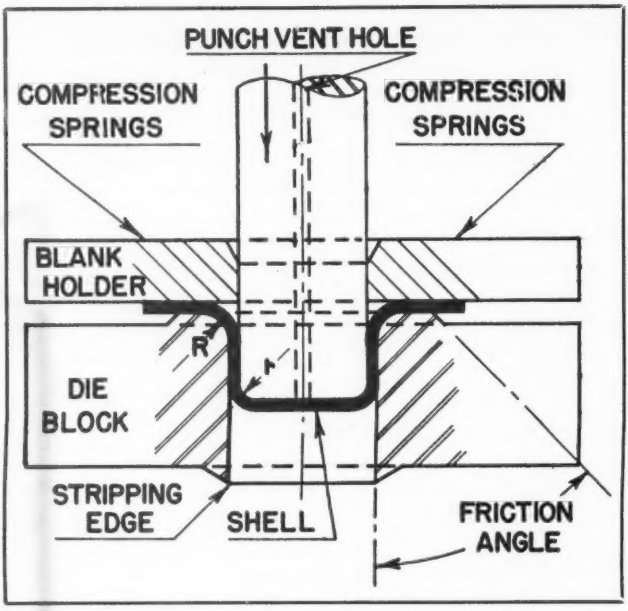

Fig. 15 — Drawing showing die block on which a friction ring is provided around the die hole.

per draws best and likewise dead soft brass. Good drawing brasses are cartridge brass and admiralty metal which are practically the same alloy, both being a 70-30 mixture of copper and zinc. Pure aluminum draws easily, but alloyed aluminum will not take a severe draw and the die radius must not be less than four to six times the work thickness.

The relation of the stock thickness to the shell diameter should be considered. An extra thick blank can be drawn without a blank-holder over the die if the blank is too thick to wrinkle. In that case expense is avoided by not using a blank - holder. With A-1 die conditions and highly ductile material, the depth of draw in one operation should be about the same as the shell diameter, but this rule can be exceeded slightly in some cases. With a die having a special drawing punch, this rule can be ignored (see Fig. 14). The drawing punch is provided with a sharp shoulder 0.003 inch deep at height **H**, which distance is safely under the shell diameter and the prescribed rule. The shoulder on the

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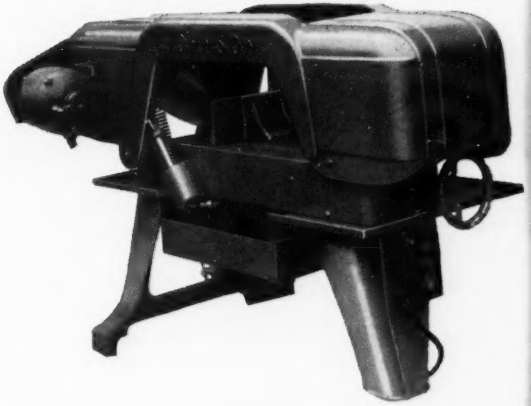

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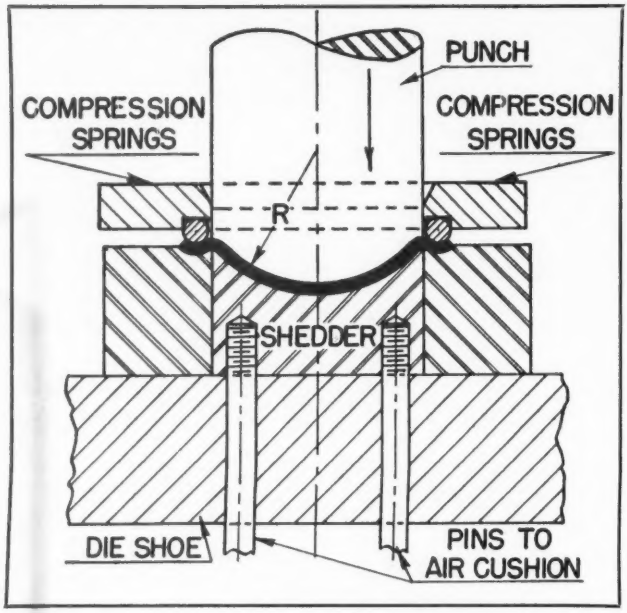

Fig. 16 — Drawing showing die block on which a friction ring is provided around the die hole.

punch in descent will "bite" into the shell wall, thus relieving drawing tension on the end of the punch. This is a sure method for drawing deeper shells without fractured corners.

The drawability of sheet metals is largely a matter of experience, judgement, and a tryout with regard to what sizes of radii to use on the punch face and around the die hole. In a die that uses a blank-holder when drawing steel, an angle or friction ring can be provided around the die hole, or a friction ring is provided on the face of the blank-holder to prevent wrinkles in the shell (see Figs. 15 and 16).

Shells Drawn Thinner by Ironing

Figure 17 illustrates the effect of redrawing an annealed shell when the drawing space between the punch and dies is less than the original material thickness. The object is to produce a shell in which the bottom remains the original thickness but with the side walls made thinner.

Shell wall must not be reduced by ironing more than 10 to 12½ per cent in one draw unless the work material is very ductile. The working members

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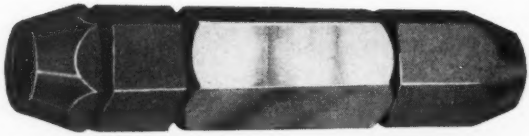

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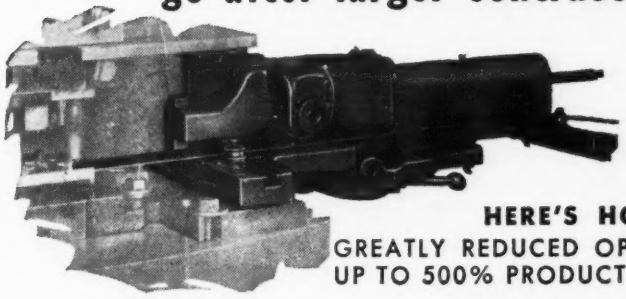

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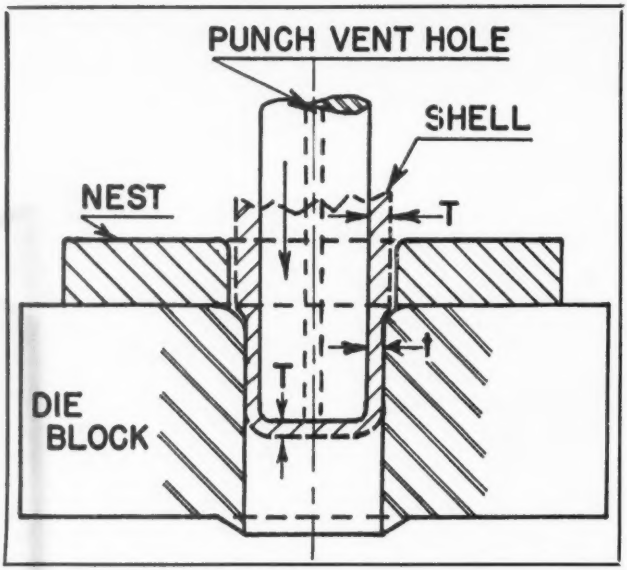

Fig. 17 — Illustration showing the effect of redrawing an annealed shell when the drawing space between the punch and die is less than the original material thickness.

in the die must be hard tempered, smoothly ground, and then highly polished in the same direction as the draw, similar to a burnishing die. Thinning of the shell walls is often done by cartridge manufacturers. This operation obviously affects the computation of the blank diameter. We find that the mean height of the finished shell is approximately **ht/T,** in which **h** is the ironed shell height, **t** the ironed thickness, and **T** the original thickness of the work material. Use the mean height of the ironed shell instead of the actual height of the unironed shell to obtain the blank diameter.

In computing sheet metal blank sizes, the formulas given are useful irrespective of the type of metal.

The next article in this series will continue with the discussion of designing drawing and redrawing dies.

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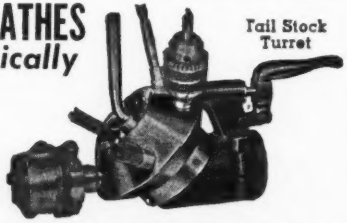

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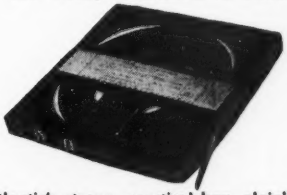

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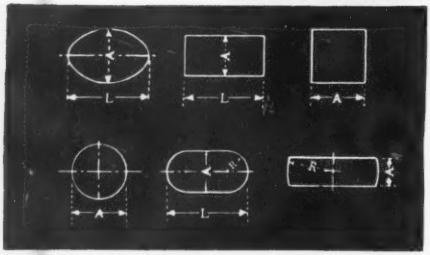

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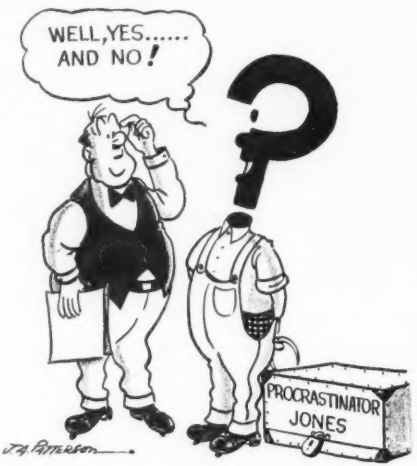
ROCKFORD CLUTCH DIVISION
BORG-WARNER
300 Catherine Street, Rockford, Illinois

ROCKFORD CLUTCHES

Little Chats On Practical Psychology

Number 3—The Procrastinator Is a Thief of Your Time

THE procrastinating worker may steal valuable time that you should be using to help another worker learn his job or to plan your own work. If you dally overlong with the procrastinator, you cannot help other people and watch other aspects of the work in your department as you should.



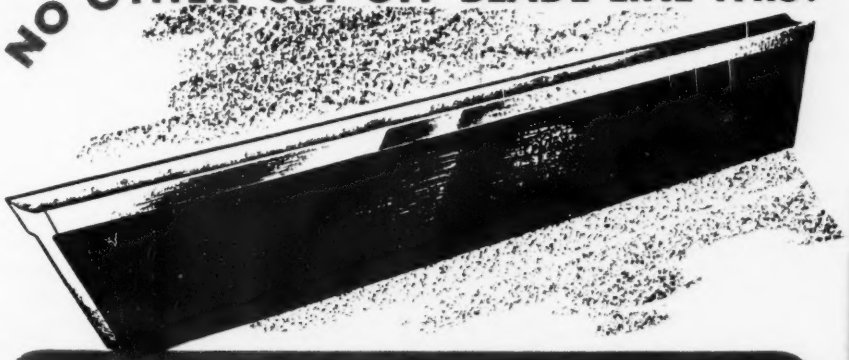
You've all met the procrastinator. He puts things off again and again. He usually agrees with you that "something should be done" and will offer little or no objection, but will never get around to doing anything. He won't say "yes" positively, and he won't say "no". He is the best "putter-offer" you ever came across.

Sometimes the procrastinator turns out to be another supervisor, someone in another department from whom we expect fast action and cooperation in getting things done. When we find a man who appears to be a procrastinator by nature, we must realize that it is not that he has any real difficulty in making decisions or solving problems, so much as it is his ingrained dislike of committing himself to any course of action.

He hasn't much question or doubt about the problem or what you are saying or the reasonableness of your request. He just hasn't the intestinal fortitude to convert a decision into action. Possibly all his life this man has had someone else making his decisions for him. Very likely he takes home his pay envelope at the end of the week, turns it over to his wife, while she doles out $5.00 expense money for him for the following week. Perhaps he has been badly burned in the past because of some poor decision he made, and feels that when hindsight is so easy foresight is just too difficult.

Keep your dealings with the procrastinator strictly on a business basis. Don't be tempted into any prolonged

NO OTHER CUT-OFF BLADE LIKE THIS!



Luers Cutting-off Blade

Empire Tool Co. is the LEADER in cut-off blade developments—backed by twenty years' experience in cut-off blade manufacture.

Cut-off blades are tools subject to conditions different from those of other tools and will perform most efficiently only when specialists' recommendations are followed.

Available from stock are blades of four types of high speed steels developed to meet the demands of cut-off operations. And on short notice you can get blades of cast alloys and tungsten carbide.

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conversations, but explain sometimes that you are not just rushing off or ignoring him; rather, you have things which must be done and he can cooperate with you in getting the team job done by acting promptly and helping you save your time.

Sometimes it is effective with these people to use a little conversational or psychological "dynamite"—show him where he loses personally by failing to reach a decision and act promptly. Show him how important it is to be decisive rather than dilatory. Dramatize the need for and the importance of the action you want from him. Show him how his action is really a challenge, an opportunity he can't afford to pass up.

Finally, you can use the put-'em-over-a-barrel technique by saying something of this kind: "Bill, I know lots of people around here who waste my time and their own, as well as the time of other people in the department, simply because they can't make up their minds to a thing and then go through with it. You're a man with the courage of your own convictions. When you decide to do something, you get it going at once. You don't dilly-dally; you get results, and results are what we want here. Now this is what we have in mind . . ."

Remember that in dealing with the procrastinator, as with other "difficult" types of people, you are really building goodwill and strong personal relationships which will make your working force an effective team for months and years to come. The hasty, ill-considered action, the sharp rebuke, or the nasty retort may make you feel better for a moment, but only a careful analysis of the individual's idiosyncracies and the proper method of handling

Your Hardness Tester . . .

Standard "C" Diamond Cone
$18.00 F. O. B. Detroit

IS ONLY AS GOOD AS THE DIAMOND IT USES

Dependably accurate "Rockwell" testing results are obtained only when every part of your hardness testing equipment is made to precision limits. That is why a correctly designed diamond penetrator is of such great importance. Always specify CLARK Diamond Cone Penetrators, both for Standard and for Superficial "Rockwell" testing. They are accurately made to the proper size and shape; exactly formed by expert lappers. CLARK Penetrators are designed for use on all "Rockwell" type testing machines.

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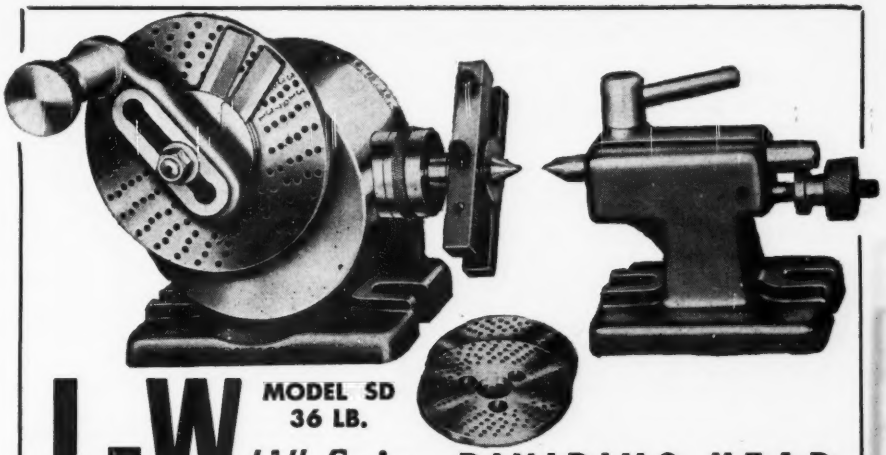

L-W MODEL SD 36 LB. 6½" Swing DIVIDING HEAD

Ideal for Smaller Milling Machines

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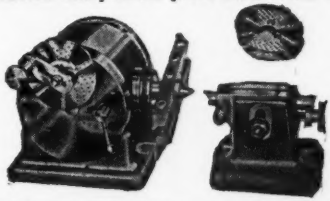
Heavy duty headstock and tailstock designed for maximum rigidity. Alloy steel threaded headstock spindle with extra large tapered bearing and takeup adjustment collar. Head tilts to 90° in vertical position. Alloy stress-proof steel worm and accurately cut worm wheel cut to close limits for accuracy. Ball bearing thrust and adjustable for end play. Complete with three index plates for dividing all numbers to 50 and even numbers to 100, except 96T. Index chart shows all divisions obtainable to 380. Right or left hand models.



Model BP 11" Swing for plain milling machines. Shipping weight, 140 lbs.... **$199.54**

Model AU 11" Swing. Fully Universal for complete indexing and spiral cutting. Shipping weight, 190 lbs. **$296.06**

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Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

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them will enlist his support in the long run.

Take time to handle the procrastinator carefully, but don't let him waste **your** time.

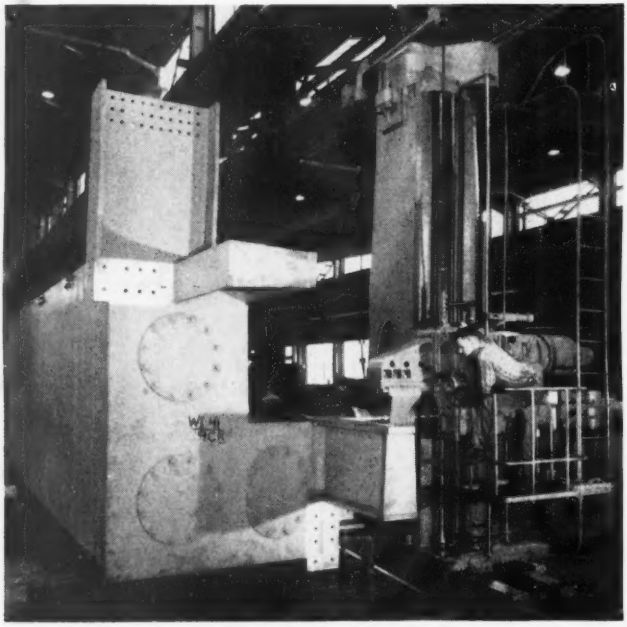
"Grits That Grind"

The Norton Co., Worcester 6, Mass., now has available for immediate showing a new color motion picture on abrasives and grinding wheel manufacture entitled "Grits That Grind." It is a 30-minute 16 mm. film showing step-by-step manufacturing processes from mining bauxite in Arkansas to the finished products in Worcester; namely, Alundum (aluminum oxide) and Crystolon (silicon carbide) grinding wheels. The film also touches on other Norton products such as grinding machines, refractories, pulpstones, sandpaper, sharpening stones, porous mediums, non-slip floors and tile, and wear-resistant products.

"Grits That Grind" is available free of charge on loan by writing to the Norton Company at the address given above. Copies of the film may also be purchased.

Delicate Milling Operation

A WORKMAN at the Dravo Corporation's Pittsburgh, Pennsylvania plant keeps close watch over a delicate milling operation on an aircraft landing gear testing machine section. A tungsten carbide cutter is being used in machining the work which is handled on a new Giddings & Lewis high power precision horizontal boring, drilling and milling machine of the floor type, recently installed in Dravo's modern machine shop. Equipped with telescoping platform, adjustable vernier scales, and telescopic vernier sight, the unit weighs—with floor plates and tooling—about 90,000 lb. It is mounted on a 36-inch solid concrete base.



EXTENDING THE USEFUL LIFE OF ALL ENGINES AND EQUIPMENT IS A MUST

Service is the mileage maker and prolonger of machine and equipment life. Be adequately equipped to repair and service them.

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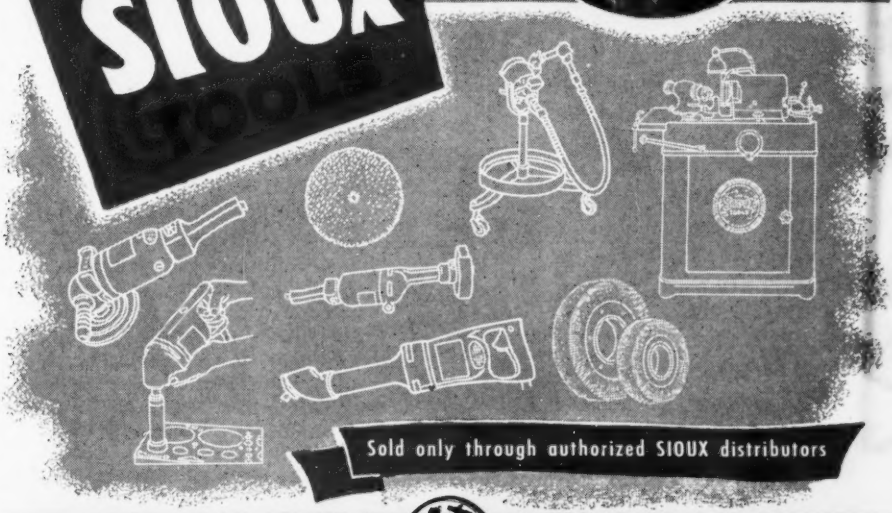

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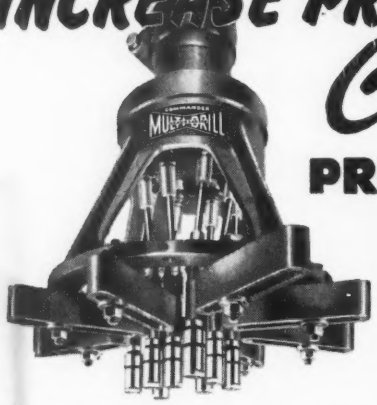
INCREASE PRODUCTION with Commander PRODUCTION TOOLS

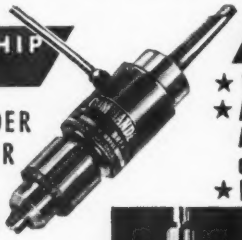


Adjustable MULTI-DRILL

★ DRILLS UP TO 8 HOLES AT 1 STROKE
★ ADJUSTABLE TO *ANY* HOLE PATTERN
★ FITS *ANY* DRILL PRESS

You can drill 2 to 8 holes at one stroke of a MULTI-DRILL equipped drill press. Instantly and easily adjusted to any hole pattern . . . compact in design and ruggedly built for years of service, thousands of MULTI-DRILLS are cutting costs and increasing output up to 800% wherever metal, wood or plastics are drilled.

New DRILL CHIP BREAKER



Get these COMMANDER DRILL CHIP BREAKER benefits now:

- **Faster Drilling**
- **Deeper Holes**
- **Better Holes**
- **Longer Drill Life**
- **Safer, Cleaner Work**
- **REDUCED DRILLING COSTS**

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CHIP BREAKER CHIPS

Write for illustrated Circulars on Commander Production Tools. Your nearby Commander Distributor carries the full line—write for his name.

COMMANDER TAPPER

★ 1 Tapper Handles Taps #0 to ¾"
★ Automatically Sensitive... Any Operator Can Do Precision Tapping
★ Fits ANY Drill Press

Commander Tappers "think for the operator"—automatically stop when taps are dull, overloaded, or when they strike bottom in blind hole tapping—permit faster tapping, better work, even with inexperienced operators. Torque control provides positive tap protection from #0 to ¾"...spring clutch eliminates slippage, assures smooth, quiet, easy operation.

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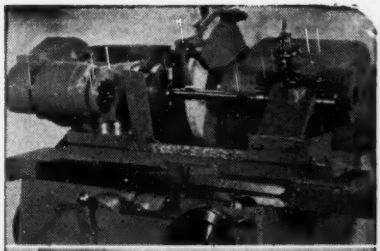
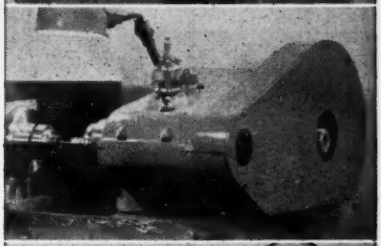
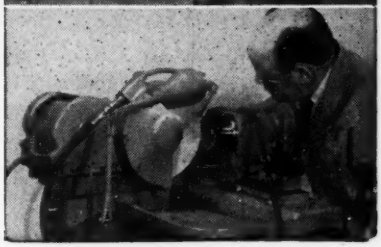






ARTER

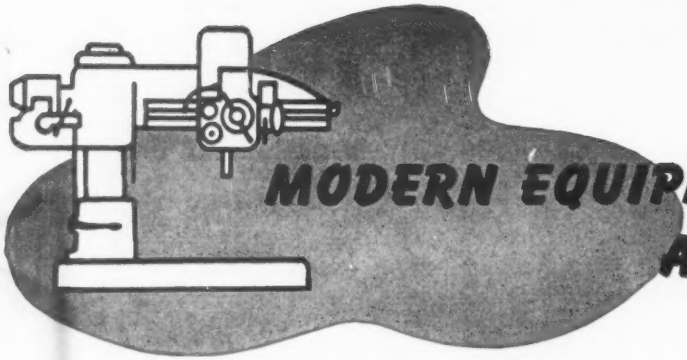
MODEL No. 103

A relatively low-priced machine for cylindrical, internal, end or surface grinding.

The ARTER Model No. 103 grinder can be purchased as a combination machine for the classes of work illustrated, or it can be purchased just for cylindrical jobs, or for internal work. Many of these machines are being used for tool room work or as auxiliary equipment to take the overload of higher priced machines.

Capacities: With internal head—1/8" to 3" dia. x 4" long. With external head—3" dia. x 10" long. Swing over table 9".

ARTER
GRINDING MACHINE CO.
WORCESTER, MASSACHUSETTS • U. S. A.



MODERN EQUIPMENT AT WORK

Easy Handling of Notched-Coil Silver Brazing and Soldering Rings Increases Transformer Connector Production by 62 Per Cent

THROUGH the use of notched-coil silver brazing and soldering rings designed for fast, easy, and safe handling, a manufacturer of electrical equipment has increased the brazing output of electrical transformer connectors by 62 per cent over previously employed machine-wound individual rings. Looseness and tangling of individual performs during handling limited brazing output to 360 assemblies per hour in spite of the fact that the gas-air heating equipment for the operation was designed to heat to brazing temperature a minimum of 500 pieces per hour. The use of notched-coil rings eliminated the handling problem and raised the production rate

Operator in background illustrates the convenience with which rings can be detached from the coil and placed into transformer connectors as they revolve above open gas-air jets. Assemblies require no preheating and are fully brazed when the work table completes one revolution. Operator in foreground removes finished assemblies and inserts new units for brazing.

1876 1951

MARK OF QUALITY FOR 75 YEARS

★ For three-quarters of a century this familiar trade mark has been a symbol of *quality* and *dependability.* It has been an unfailing guide to the finest tools that skill and experience can produce—Twist Drills, Reamers, End Mills, Screw Extractors, Arbors, Mandrels, Counterbores, MO-MAX High Speed Ground Tool Bits and Cut-off Blades. ◈ The demand for these tools has increased steadily throughout the years, requiring a continuous expansion of our manufacturing facilities. Today we have a total of ten acres of floor space.

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100%
CONCENTRICITY
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TESTS ASSURE
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LONG LIFE OF
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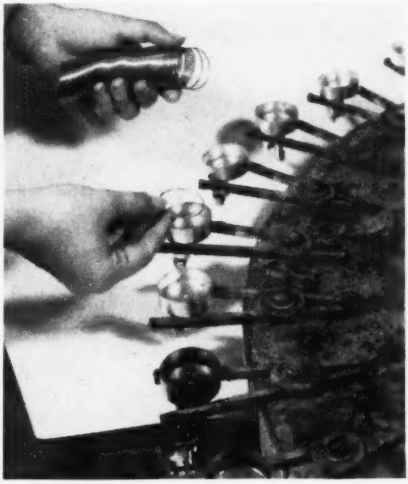
FRANKENMUTH 9, MICHIGAN

to 560 assemblies per hour on the same heating unit.

Developed by the Lucas-Millhaupt Engineering Co., Cudahy, Wis., the notched-coil rings are wound from continuous wire in job-determined wire thicknesses and diameters according to individual specifications. The wound coil is then slotted along the outer diameter to permit fast, easy detachment

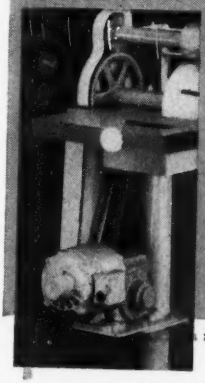


A notch extending along the outer and upper diameter of each ring permits safe, easy detachment without distorting preforms and eliminates lost motion in handling. Unused rings can be stored safely in coil form since the notches are strong enough to hold them in place.

of rings individually from the coil without tangling, distorting, or breaking so that the task of detaching a ring from its coil and placing it on the workpiece is performed in one operation.

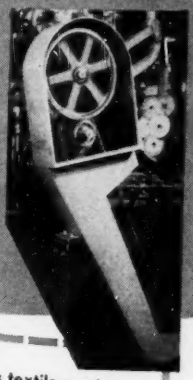
In the particular job under discussion, the stress-relieved notched-coil rings were used with an improvised gas-air heating unit set aside for development work. Employing a mixture of 16 oz. of air pressure with natural

BY "SAVING" $19.90 ON THESE TWO DRIVES THEIR USERS LOST $446.10



This compact, efficient, long lived polishing machine drive comprises BOSTON RATIOMOTOR, BOSTON SPROCKETS and CHAIN, BOSTON GEARS.

This textile yarn drawing machine drive employs BOSTON SPROCKETS, BOSTON DOUBLE ROLLER CHAIN, BOSTON GEARS. Oil tight chain case permits oil-bath lubrication. Maximum production, no slippage, no power loss, minimum maintenance are assured by this drive.



To save **$12.50** first cost this chain drive on a sheet metal polishing machine was equipped with cheap sprockets. They wore out fast — caused a wobble that hurt machine performance — had to be replaced by BOSTON Sprockets and Chain.

Cost of replacing drive (two men, 4 hrs. @ **$4.25** per hr.) — **$34.00.**

Down time loss (profit and overhead) 4 hrs., 30 sheets per hr., **$1.20** per sheet — **$144.00.**

$144 + 34 — 12.50 = $165.50 *net loss.*

To save **$7.40** this textile machine drive was equipped with "bargain counter" sprockets and chain. It wore out and broke down *twice*, before being replaced by BOSTON Sprockets and Chain.

Cost of replacing drive, two times (two men, 4 hrs. each @ **$3.00** per hr., each time) — **$48.00.**

Down time loss (profit and overhead) 80 bobbins, 4 hrs. down, each time, **$1.50** per bobbin — **$120.00** x 2 — **$240.**

$240 + 48 — 7.40 = $280.60 *net loss.*

It pays to buy the best — Boston Gear Sprockets. Design them into your equipment. Always specify them for replacements.

BOSTON *Gear stocks are Near*

Stocks at 80 Authorized Boston Gear Distributors—one near you.

Write for Catalog No. 55. It contains a wealth of useful data and selection charts.

BOSTON GEAR WORKS

68 HAYWARD ST., QUINCY 71, MASS.

gas, the heating unit consists of a 30-prong revolving fixture which is driven by a ½ h.p. motor through a hydraulic transmission at variable speeds up to 3 r.p.m. The brazing temperature, which is constant, determines the speed of the rotating work table, and the speed in turn determines whether one or two operators are to be used for the job at hand.

Giant Vertical Boring Mill Solves Tank Production Problems

A CONCRETE example of how foresight and planning get results was given recently when the Cadillac Cleveland Tank Plant turned the first Walker Bulldog tank over to the Army three months ahead of schedule. One of the principal pieces of equipment in the plant responsible for the record - breaking production is a 24-foot Betts vertical boring mill, as shown in the accompanying illustration. Through careful analysis of available machines and tools, the Cleveland Tank Plant not only obtained this vitally - needed machine in half the time ordinarily required for its manufacture but also doubled its usefulness and cut its cost almost in half.

Studies of production tool requirements begun last July when the Cadillac Motor Car Division was assigned to build the Walker Bulldog showed that two boring mills large enough to swing a tank hull on the table of each

PRECISION BUILT ... to your blueprint
SPECIAL CUTTING TOOLS
High Speed Steel and Cemented Carbide Tipped
"BETTER" if it's made by FULLER!
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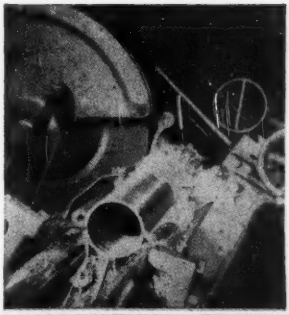

Improved Centerless Wheel Grinds RIGHT

CARBORUNDUM'S improved V10 Bond Grinding Wheels are engineered to maintain grinding efficiency with minimum contact pressure. Their continuous cool, free-cutting qualities produce dimensionally accurate work to required finishes... free from chatter marks, scoring, or burning. Ideally suited to heavy stock removal on both hard and soft materials, these wheels are being used increasingly in the entire range of centerless work, throughfeed and infeed.

Your CARBORUNDUM representative will be glad to discuss proper gradings and applications in obtaining most effective results. Write Dept. MS 81-20

Only CARBORUNDUM

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makes ALL Abrasive Products ...to give you the proper ONE

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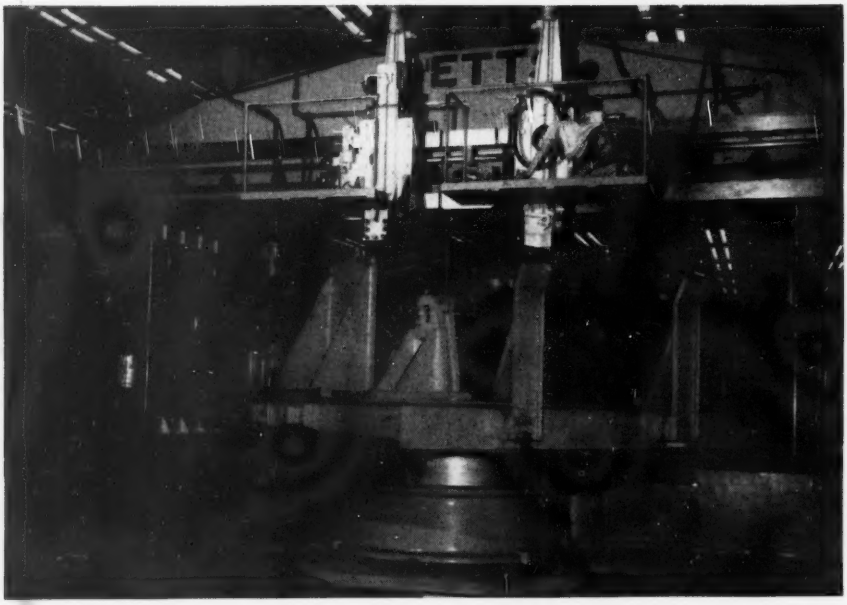
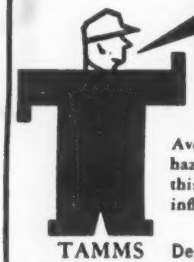


This giant vertical boring mill installed in the Cleveland Tank Plant of Cadillac Motor Car Division is used to machine turret ball races on Walker Bulldog tanks.

machine would be needed for Tank Plant production lines. These mills were to be used to grind and finish the surface on the tank's hull which supports the turret. This critical ring surface is employed for mounting what is technically known as the turret ball race. A machine large enough to perform these operations, however, was found to require more than a year to build and, since orders were "to get into production as fast as possible," this much time was out of the question.

To help solve the problem of faster procurement, engineers from the Methods and Equipment Department of Cadillac got together with tool and machine designers from Consolidated



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Avoid costly accidents caused by slipping on oily or greasy floors! Reduce fire hazards! Replace sawdust or wood shavings with Fuller's Earth. Every shop needs this low-priced safety aid. Fuller's Earth *absorbs* oil and grease—and it's non-inflammable. Write for FREE SAMPLE to test.

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ENDS TAPPING TROUBLES

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Ultra Precision
THREAD-CUTTING BROACHES deliver these advantages:

- End tapping trouble.
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- Feed the chips out of the hole.
- Lower production costs.
- Replace standard taps in most sizes.

SHEARCUTTER TOOLS COST LESS IN THE LONG RUN

These ultra-scientific cutting tools are used by practically every large manufacturing company in the U.S.A. Constant repeat orders prove their merit and value.

Patent Warning: All Shearcutter Tools are protected by U.S. and Foreign Patents, received, pending or applied for.

***ANOTHER AMAZING INVENTION OF RALPH GORDON FEAR**

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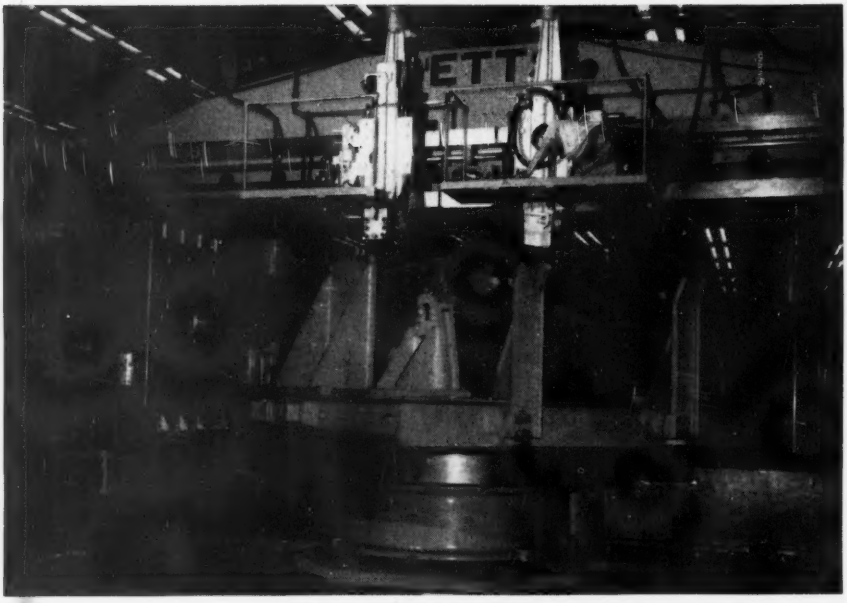

This giant vertical boring mill installed in the Cleveland Tank Plant of Cadillac Motor Car Division is used to machine turret ball races on Walker Bulldog tanks.

machine would be needed for Tank Plant production lines. These mills were to be used to grind and finish the surface on the tank's hull which supports the turret. This critical ring surface is employed for mounting what is technically known as the turret ball race. A machine large enough to perform these operations, however, was found to require more than a year to build and, since orders were "to get into production as fast as possible," this much time was out of the question.

To help solve the problem of faster procurement, engineers from the Methods and Equipment Department of Cadillac got together with tool and machine designers from Consolidated

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Machine & Tool Co., Rochester, N. Y., manufacturer of the Betts boring mill. Since boring mills with 12-foot beds were not readily available at that time, the engineers worked out a way of extending the side columns of a 12-foot mill to obtain a "'swing clearance" or capacity of 24 feet. In reality, the effective working radius of the machine was doubled without the expense and consumption of time to build a machine twice the size. Further time in manufacturing the mill was saved since this "expanded" design also permitted the use of standard 12-foot machine elements, all of which were obtained in a reasonably short time and without the expense of building larger parts.

After the problem of procurement was solved, Tank Plant engineers went on to double the usefulness of the machine by adapting a grinding head to be used in conjunction with the machining tools so that four operations can now be performed instead of two; namely, machining, boring, facing, and grinding. The giant machine, which required only 5½ months to build, weighs 114 tons, measures over 17 feet high, and costs only half as much as a new 24-foot machine, including the expense of adapting the machine for grinding. Because of its unusual flexibility, this mill will be able to handle all machining operations for which it was designed on any type of tank or

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vehicle the Cleveland Tank Plant may produce. Accuracy has been built into the machine also for despite its great size, tolerances of 1/1000 of an inch can be held over large areas, such as the 84-inch diameter of the ball race surface on the Walker Bulldog. A second mill of similar design now under construction will also be purchased at a saving of approximately half over the original cost.

Modified Standard Machine Performs 18 Broaching and 9 Assembly Operations in Two Cycles

FIGURE 1 shows a modified standard machine used by a leading tractor producer for machining a cylinder head employed in its engines. The machine is a Colonial Broach Company Type PA 15-ton 24-inch stroke assembly press fitted with multiple broach holders and other necessary equipment for producing the cylinder head on a medium quantity basis. The machine is designed to broach nine valve and pushrod guide bores to size, assemble nine valve and pushrod guides in place, and broach valve guides to size—all without removing the cylinder head from the machine.

In operation, the operator slides the head into place in the machine. Retracting type locating pins (interlocked with the machine operation) locate the head while it is being locked into position with hydraulically actuated manually

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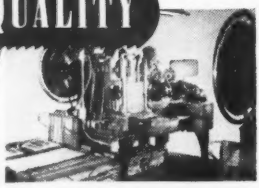

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controlled clamps. Nine broaches, six of one size (for valve guide bores) and three of another size (for push-rod guide bores) then broach the bores on the downstroke of the press. At the end of the stroke, the broaches are automatically released and dropped into a partitioned receptacle in the base of the machine. Meanwhile, the head of the machine returns to the

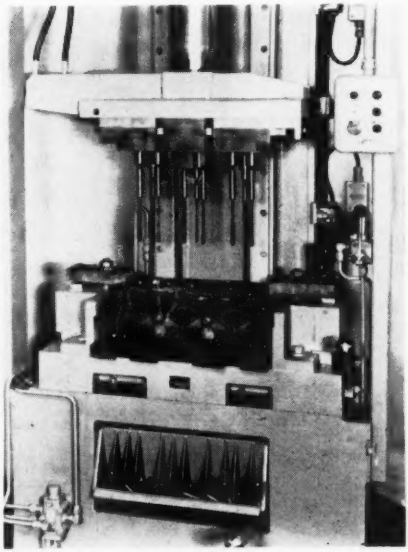

Fig. 1—Eighteen broaching and nine assembly operations are performed on a cylinder head in two complete cycles (four strokes) of this modified standard assembly press. Broaches and guides are shown in place ready for pressing in of the guides on the downstroke and broaching the bores of the guides on the return stroke.

upper position automatically. At the same time, the broaches for broaching the guides themselves are placed in an aluminum pallet, as shown in Fig. 2, and the corresponding valve or push-rod guides are slipped over the ends of the broaches. The lightweight pallet is lifted into position under the head,

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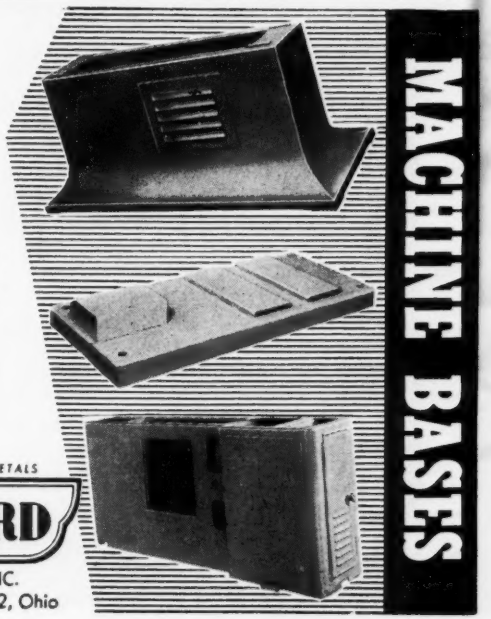

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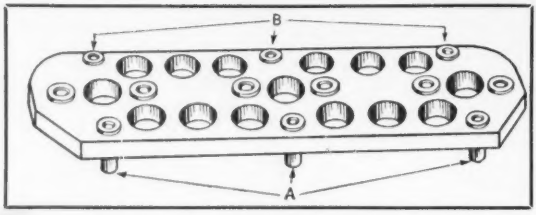

Fig. 2 — Sketch of lightweight aluminum pallet used as a retainer and loading device to quickly insert nine broaches and guides into the head of the machine shown in Fig. 1. The pallet can be used for both right and left-hand cylinder heads by employing the push-rod bore broach holders A and B.

engaging the broach ends in the pullers. A lever serves to lock the broaches. The pallet is then removed and the head moves down, causing the guides to be pushed into the broached bores to precisely the correct depth, as assured by a definite stop for the head. On the return stroke of the head, the broaches are pulled through the guides, finishing them to size. The pallet is then lifted in place and the broaches are released, dropping into their respective receptacles in the pallet. A lever at the base of the machine is used to bring the receptacle containing the guide-bore broaches out of the base of the machine, and these broaches are reinserted in the head manually, ready for the next cylinder head.

Among the advantages of the setup is the fact that the valve guide broaches actually serve as "inspection" tools for the fit of the guides in their bores. If the fit is too light, the broach pulls the guide back out on the return stroke due to the fact that it requires

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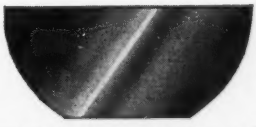

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less effort to broach the inside diameters of the guides than to push the guides into place if the fit is correct. By performing all operations from the same setup, the spacing between all valve and push-rod guides is also accurately maintained. Accuracy of the entire operation is indicated by the tolerance on the inside diameters of the finished guides, which is held to plus or minus 0.0005 inch. The same tolerance is specified for the bores into which the guides are pressed. Actually, the setup is so designed that two different sizes of cylinder heads (for two different engines) can be produced on the same machine. Different broach sizes are used, of course, for the two heads.

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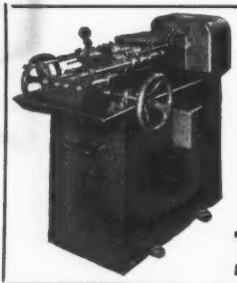

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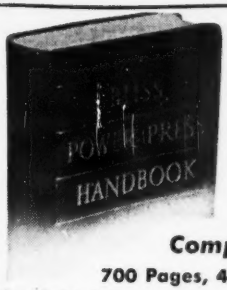

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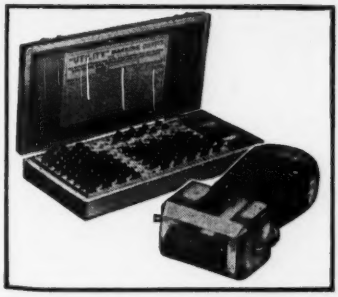

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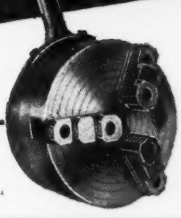

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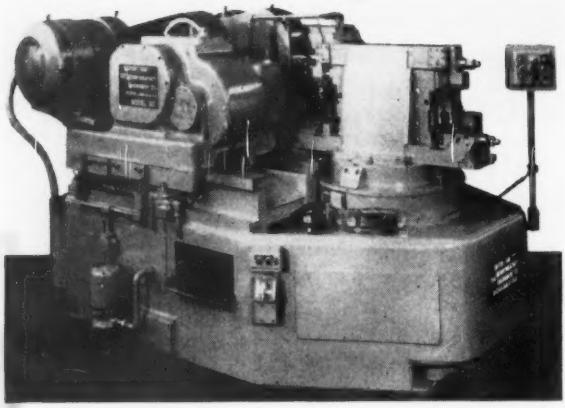

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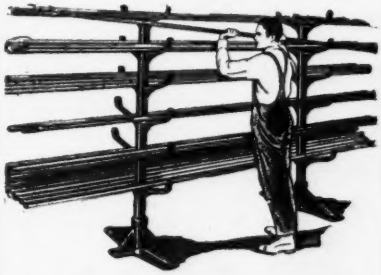

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BROWN ENGINEERING CO.

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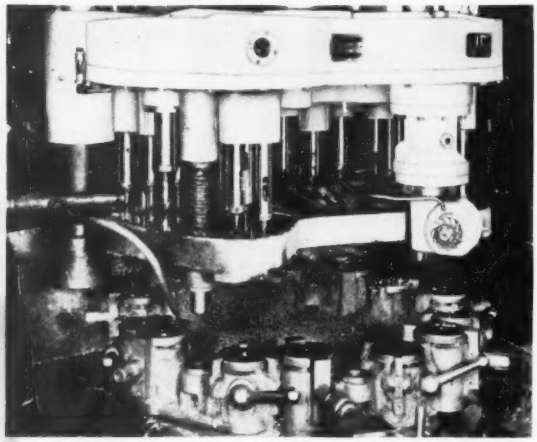
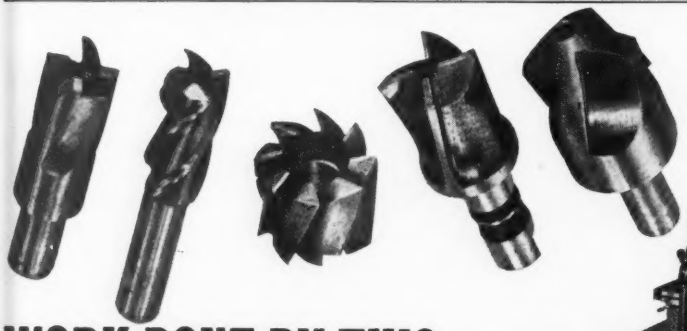
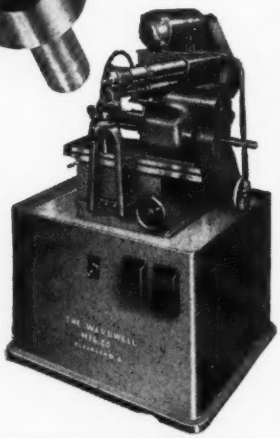


Special drill head is used to machine compressor parts at Borg-Warner Norge Division Chattanooga plant.

Products Corp., Lancaster, Pa. for machining compressor parts at the Chattanooga plant of the Norge Division of Borg-Warner Corporation. The parts, which consist of pressure molded cast iron, are held in an eight-station rotary indexing table while they are drilled, reamed, countersunk, trepanned, and milled. The pieces are machined first on one side and then turned and machined on the other side in a two-cycle run. Each spindle of the drill head revolves at a speed suitable for the operation it performs, varying from 127 to 2,000 r.p.m. A completed part is ejected with every stroke of the drill press spindle.



Write for Bulletin 90FM Hydraulic Flutemiller



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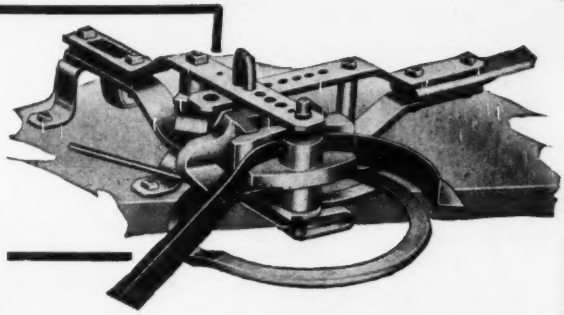

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"Versatile" is the word for the unusual Ellis Dividing Head. This beautifully designed and built unit can extend the profit and production possibilities of your mills, grinders, drill presses and jig borers. It has 6½" swing, or 11" swing when used with riser blocks. Its fully universal action provides every needed setting, so that most work can be completed without rehandling. Work may be held between centers, or in chucks or collets. Write for catalog giving complete details!

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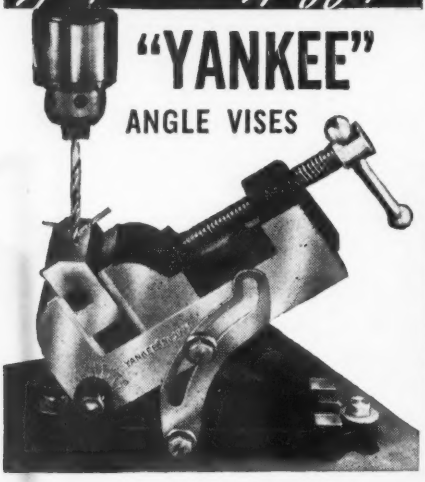
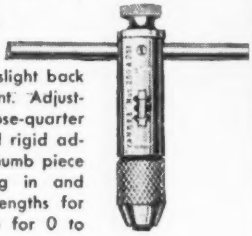
ANGLE VISES



Shortcut costs on small jobs with this fast-acting, economical jig. Lock the work in the "Yankee" Angle Vise. Tilt for the angle and lock. You're set up for every operation . . . hand or machine. Also available with quick-release swivel base. Two jaw widths . . . 2" and 2¾". Each vise supplied with grooved "V" Block for holding rounds.

"Yankee" Ratchet Tap Wrenches for tight spots



Ratchet needs only slight back and forth movement. Adjustable cross-bar for close-quarter work. R.H., L.H. and rigid adjustments. Knurled thumb piece for speedy starting in and backing out. Two lengths for 0 to 5/16" taps, one for 0 to 3/16" taps.

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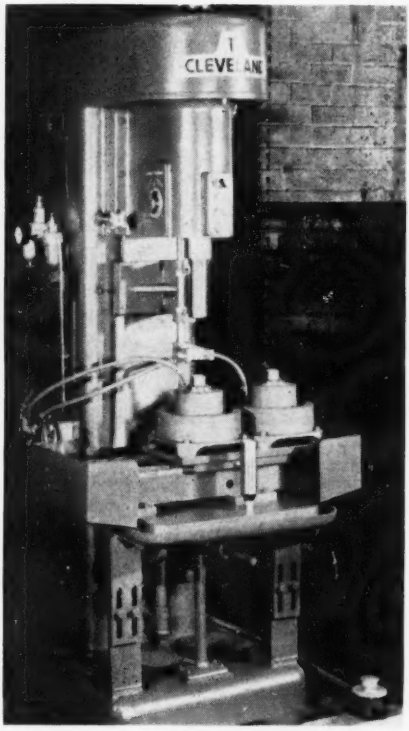
Automatic Tapper Produces 100 3.5 Rocket Body Pieces Per Hour

THE Cleveland Tapping Machine Co., Canton, Ohio, a subsidiary of Automatic Steel Products, Inc., has a substantial number of its new Model



Cleveland Model E-40 Lead Screw Production Machine set up for tapping 3.5 rocket bodies at the rate of 100 pieces per hour

E-4U lead screw production machines in various munition plants turning out 3.5 rocket bodies at the rate of 100 pieces per hour. The machine is fully automatic in operation except for loading and unloading. The fixture is of the shuttle type and is air operated, as

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Grinder No. 1010 shown here is a rugged 130 lb. general service grinder with 36 & 60 grit 10" wheels. 3 phase, 1725 RPM motor will take plenty of overload and abuse. Will not burn out. Balanced wheels, dynamically balanced armature. Wide clearance between wheels and motor frame allows working on large or odd-shaped pieces.

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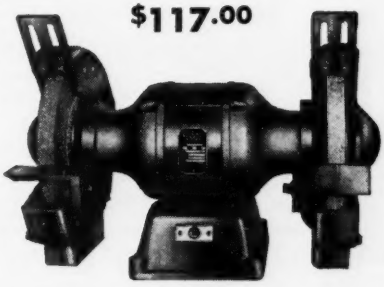

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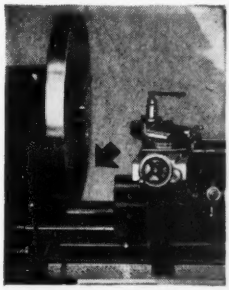
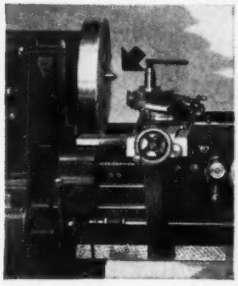
Nebel

extension bed gap lathes

for railroad, mining and maintenance work





write for descriptive bulletins

Get the productive capacity of two lathes . . . get the biggest value in metal-turning equipment . . . get a Nebel extension bed gap lathe in 28″/50″ or 20″/40″ sizes.

The Nebel Machine Tool Co., Cincinnati 25, Ohio

Setup for drilling six ⅛-inch diameter x 1⅝-inch deep holes in high alloy steel tank clutch bearings at a rate of approximately 21 parts per hour

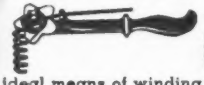
The equipment consists of a special automatic indexing machine produced by The Avey Drilling Machine Co., Cincinnati, Ohio, and having three No. 1 Aveydraulic deep-hole drilling units complete with torquematic control for automatic withdrawal for chip removal. The drilling units are mounted horizontally 120 degrees apart on a fabricated steel base which contains a suitable chip and coolant trough and built-in hydraulic systems. The base also contains a six station automatic indexing table.

The sequence of operation consists of loading one part whereupon three holes are drilled, after which the part is indexed 60 degrees and three additional holes are drilled. All units are electrically interlocked by a J.I.C. electrical control panel containing a complete set of indicator lights which act as signals to the operator in order are the chucks for holding the part. A cutting speed of approximately 34 feet per minute is employed. The material used in this part is 4140 seamless steel tubing, hardened to 35-37 Rockwell. The thread is a 1 25/32-16 pitch buttress.

Setup for Drilling Tank Clutch Bearings

THE illustration herewith shows an efficient setup used for drilling six ⅛-inch diameter x 1⅝-inch deep holes in tank clutch bearings made of high alloy steel. Production with this equipment is estimated at approximately 21 parts per hour.

A Real Spring Winder!



Will earn its cost in one day. The Hjorth Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

No. 1 Capacity 0 thru 3/32" wire $1.50
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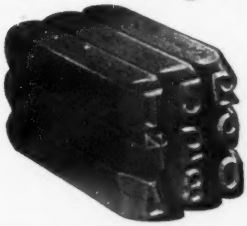

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You get more mark per dollar with THOR STAMPS. Write for catalog and prices.

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That's the reason WAUKESHA Blades *cut* with a clean, smooth, positive and effortless shear that saves in horsepower, increases production and, faithfully and regularly, gives you more holes per grind.

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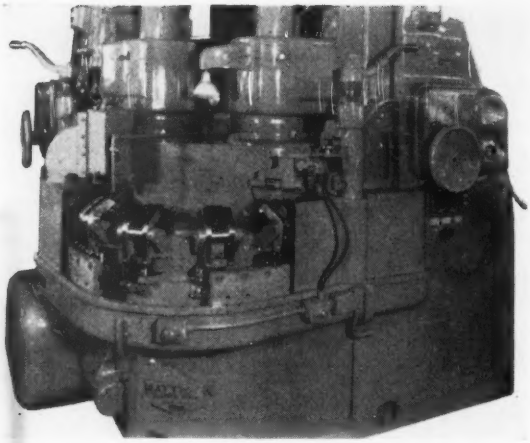

Close-up view of specially equipped rotary surface grinder for finish grinding the covers of automotive oil pump bodies. Workpieces are held in automatic clamping fixtures.

to indicate when to load and unload the machine. The part is located on the inside diameter with height location from the top face. Stationary drill bushings are used on the fixture, and the part is clamped by a quick-acting cam clamp.

Automatic Clamping Fixtures Used in Finish Grinding Pump Body Covers

MATTISON Machine Works, Rockford, Ill., has recently completed for a certain manufacturer a specially equipped rotary surface grinder for finish grinding the covers of automotive oil pump bodies. Workpieces are held in automatic clamping fixtures as shown in the accompanying close-up view of the grinder. A safety device is provided which stops the table of the machine in the event the operator does not locate the work properly in the fixtures. Automatic sizers are constantly in operation checking the work and keeping all of the pieces within the specified tolerances without any attention on the part of the operator.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

Pictured: a 24-Spindle Heavy-Duty Drill Head.

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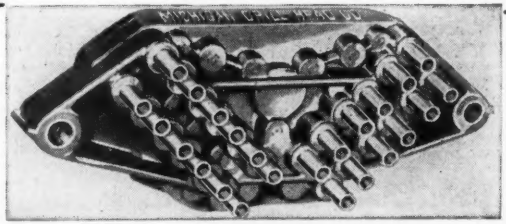
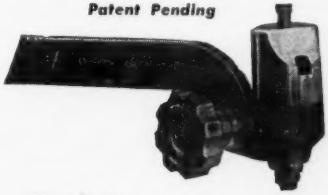


MICHIGAN DRILL HEAD CO. 971 E. 8-Mile Road, Hazel Park, Mich.

Monarch Precision
SHAPLANE
Radius Tools

Patent Pending



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Stock size punches—1/16" to 9/32" by 1/64". Can be had complete in metal box as shown or in cardboard carton.

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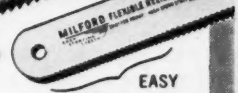

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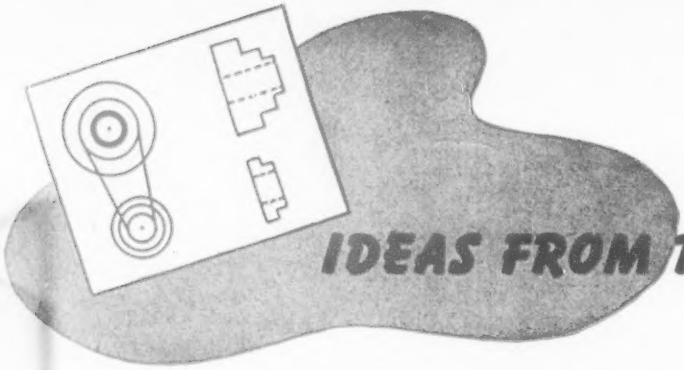
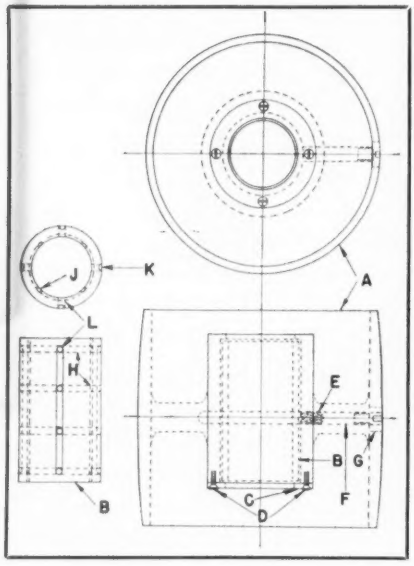


IDEAS FROM READERS

Pulley with "Floating" Bushing

By Michael Axler

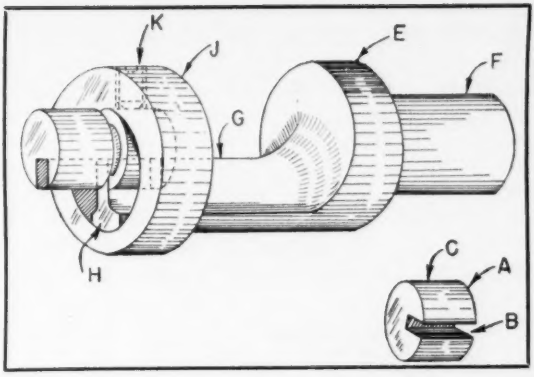
WE had an overhead transmission with one loose pulley in our shop which gave us considerable trouble. The pulley was driven at high speed and the bronze bushing therein had to be replaced every two weeks due to wear through inadequate lubrication even though the pulley was oiled twice each day. The time-consuming job of replacing the bushing consisted of removing the pulley, pushing out the old bushing, machining a new bushing, pressing the bushing in the pulley, and boring the bushing to size. So as not to keep the machine out of operation too long to affect production, we made a spare pulley which was installed as soon as the other pulley was removed for repairs, Finally, however, we designed a "floating" bushing of the type shown in the sketch and, since its installation two years ago, we have not had to replace the bushing.



Sketch of pulley with "floating" bushing

Referring to the sketch, the floating bushing **B** is installed in the pulley **A** and held in place by means of a collar, **C**, and four screws, **D**. In the rim of the pulley is an oil reservoir, **E**, and large oil hole, **F**, in the end of which is fitted a plug, **G**. The floating bushing **B** has a series of four equally spaced longitudinal grooves on the inside and outside diameter, as shown at **J** and **K** respectively, as well as four

Sketch of grinding arbor for use in the cylindrical grinding of die inserts of the type shown at *A*.



equally spaced grooves on the circumference, as shown at **H**. Eighteen holes are also drilled in the bushing, as shown at **L**. The oil reservoir **E** is filled with lampwick and oiled once each day.

Cylindrical Grinding of Die Inserts

By John E. Hyler

THERE are various types of piercing dies in which the most efficient method of making the dies is to employ inserts, placing these inserts into holes drilled in the dies. In some cases, the slots or other recesses in the inserts, answering to the holes to be pierced, are so located as to make it difficult, if not impossible, to mount such inserts between centers for final cylindrical grinding. An instance in point is shown in the accompanying sketch by the insert **A** which has been turned, then slotted, and finally ground.

Obviously, it is highly desirable to locate the insert for finish grinding directly by the milled slot itself, provided this can be arranged. With the method shown, the inserts are first turned in pairs with a deep necking cut between them which will allow them to be separated with relative ease after the finishing cylindrical grind has been made on them. The slot **B** is then used to locate and hold the insert for finish grinding the surface **C** through the use of the special holding tool shown.

The main body of the grinding arbor is of relatively large diameter, as shown at **E**, to provide rigidity and is turned down to provide an absolutely straight shank, as indicated at **F**, which can be accurately chucked. The forward end of the arbor is largely worked away so that its extended por-

NO MORE COSTLY JIGS

on small production jobs with

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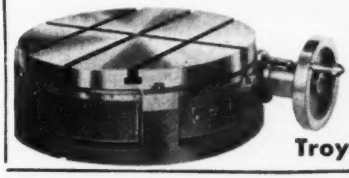

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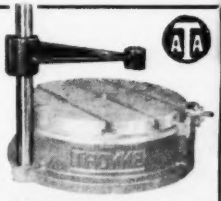
See your dealer or write for Catalog No. 17, fully illustrated, showing all models and applications to various work.



Drilling attachments can now be furnished for Worm Wheel Operated Tables.

Troyke Mfg. Co., Inc., Cincinnati 9, Ohio, U.S.A.

tion, **G**, has a top edge which will enter with a firm slip fit into slot **B** of the insert and bottom therein. Only one-half of the dual insert is engaged by this tongue of the arbor, the other half of the insert protruding from the extended end for grinding. If and when the end of the tongue **G** of the arbor has first been very carefully located and sized by a combination of straddle and surface milling relative to the axial line of the shank **F** of the position and depth of the slot **B** in the insert, it only remains to find a suitable method of clamping the insert firmly to the tongue end.

The clamp used for this purpose consists essentially of a sturdy ring, **J**, which is internally bored to a size which will allow the ring to be readily slipped over the as-yet-unground insert and the forward end, **H**, of the arbor, after which a set screw, **K**, provided in the ring **J**, is tightened to hold the insert firmly in position. After one half of the insert has been ground in this manner, the insert is removed from the arbor, turned end for end, and the remaining end ground. The ring **J** is eccentrically bored for the purpose of providing more metal at the top for better thread anchorage for the set screw **K**. After both ends of the inserts have been cylindrically ground to the desired diameter, the inserts are cut in two and the rough broken ends resulting are dressed down by surface grinding.

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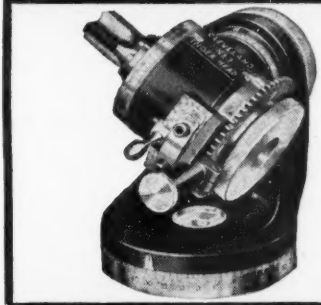
TOOL HOLDER INDEXING HEADS



Hold 1/16" up to 1½" Collets 5C or 1AM Collets and Brown & Sharpe or Morse Taper. Will adjust to any compound angle.

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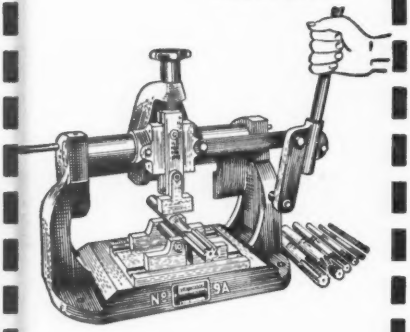

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Quick Method for Welding Extensions to Drills

By Edward Diskavich

IN the course of their work, toolmakers often require extension drills, sometimes as much as 6 inches longer than standard. Such drills are usually needed in a hurry and the usual procedure of turning down the shank of a drill to fit a hole drilled in a piece of drill rod and then silver soldering the assembly together is a time-consuming one. However, in those shops having a metal cutting band saw with built-in welding device for welding saw bands together, the job of fastening extensions to drills can be greatly facilitated. With this equipment, extensions can be readily welded to drills using the lowest possible welding heat so as to eliminate burning of the drill and rod ends. To properly align the drill and rod for welding, a dimple can be provided in the end of the rod to accommodate the drill end.

For producing a joint of maximum strength, it is recommended that a small amount of silver solder flux be placed around the rod and drill near the joint just before welding. The drill and rod, of course, are inserted in the welding device in the same manner as when welding a band saw. After the drill and extension have been properly aligned and the flux has been applied, the current is turned on, causing the joint to become red-hot and the flux to melt and run. At this precise instant, silver solder, which is in the form of wire, is touched to the joint and allowed to melt and the heat is then released. When cool, the joint is smoothed on the grinding wheel built into the welding device and annealed to eliminate brittleness before the drill is used.

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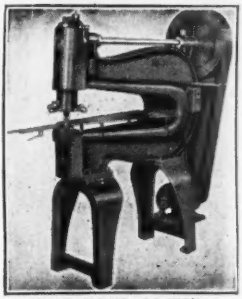

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Round Stock Drill Jig Features Flexible Design

By H. G. Frommer

IN order to cross-drill round stock economically on a small or medium production basis, the work must be set up in a fixture which allows for maximum flexibility as to size of stock, sizes of holes to be drilled, and the spacing between holes. Oftentimes, universal round stock drill jigs are designed in such a way that the workpiece rests on top of a vee, as shown in Fig. 1, while a bridge containing the drill bushings is fastened to the jig base. This arrangement, although desirable in many respects, has the disadvantage of producing greatly varying chip clearances for different diameters of stock—a fact known to contribute to drill breakage and inaccuracy of drilling. Moreover, such a

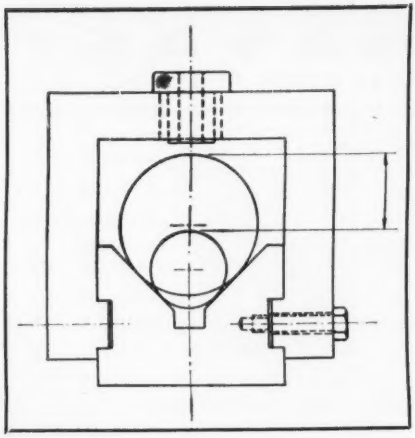

Fig. 1—This design of universal round stock drill jig provides varying chip clearances for different diameters of work, thus increasing the possibility of drill breakage and inaccurate drilling of workpieces.

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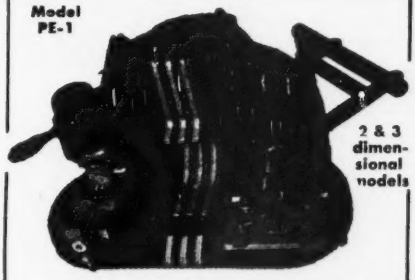

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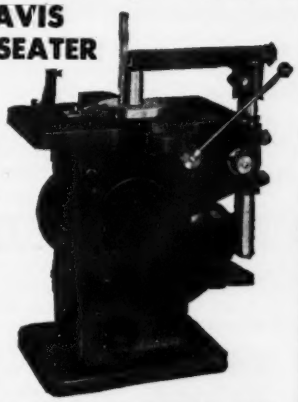

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jig frequently does not have the required rigidity for accurate and efficient work, and chip entanglement and subsequent increased cleaning time are often the result.

Attacking this problem with the most important factor—constant chip clearance—in mind, we designed a jig, as shown in Fig. 2, which maintains almost constant chip clearance for various workpiece diameters. The jig

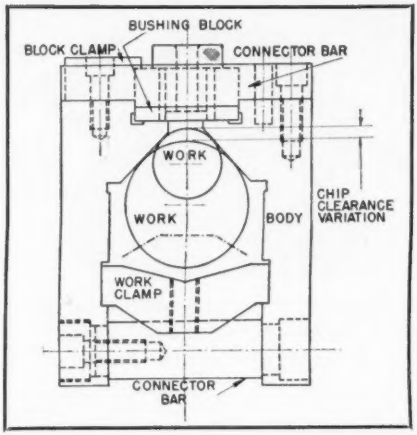

Fig. 2—With this design of universal round stock drill jig, almost constant chip clearance for various workpiece diameters is maintained.

is turned over for loading and unloading and the stock is inserted below the vee. The top of the jig is machined to an accurate channel in which drill bushing blocks are slidably mounted to provide adjustable center distances between drilled holes (if more than one hole is drilled). In addition to liner bushings, the blocks are equipped with lock screws. The outside edges of the blocks at right angles to the channel edges are machined to an even, accurate dimension from the bushing holes. This dimension is stamped on each

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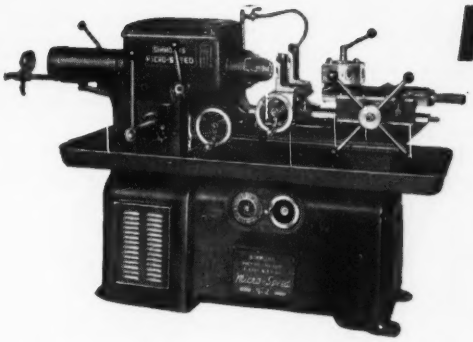

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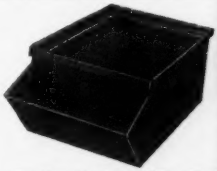

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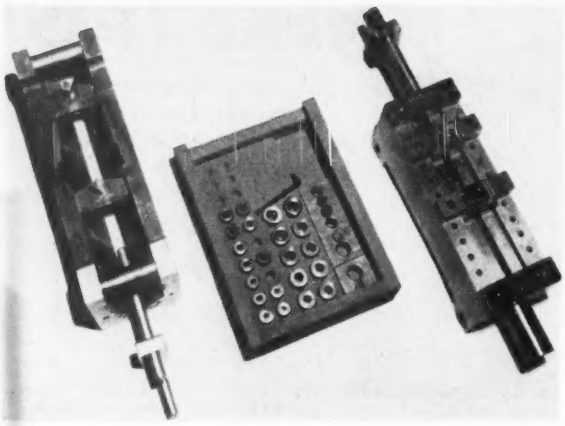

Fig. 3 — This illustration shows a bottom view (left) of a universal round drill jig for stock from ½ to 1⅛ inches in diameter; top view (right) of a similar jig for work from 1⅛ to 2⅜ inches in diameter; and supply box (center). The end stop of each jig is fully adjustable for short as well as long workpieces.

block to permit a quick setup with gage blocks, inside micrometers, or scales. Two small clamps fastened to the jig by means of socket screws threaded into one of several sets of tapped holes hold the bushing blocks in their proper places while one or more work clamps ride in slots below the workpiece. The latter clamps are curved and may be reversed. For larger diameters of work, the clamps are used as shown in Fig. 2, while the dash-dot outline pertains to the reversed position for the clamping of stock of smaller diameters.

An additional advantage of this design of jig is the ease with which cleaning is accomplished, if necessary, as chips and dirt fall away from the vee surfaces. Figure 3 and 4 are actual photographs of the adjustable universal round stock drill jig, Fig. 3 showing top and bottom views of two sizes of the jig together with a supply box and Fig. 4 showing the jig in operation.

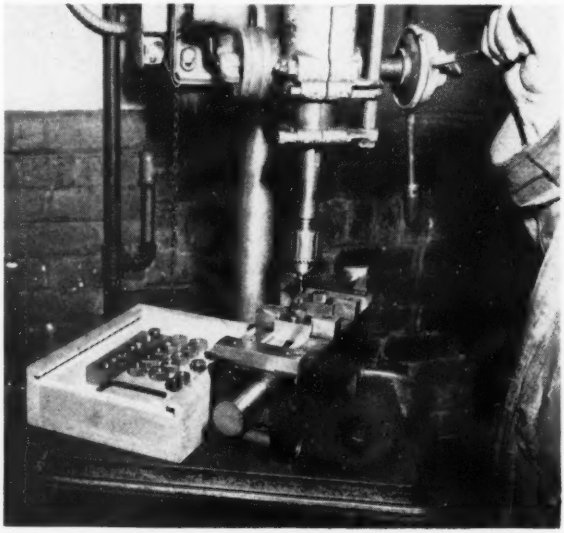

Fig. 4 — Adjustable universal round stock drill jig is shown in operation. For long wear, the jig is made of hardened and ground tool steel and is constructed of two parts, bolted and doweled together. Holes in the end of the jig are for construction purposes only. Note recessed bottom connectors to provide flat side surfaces for use of jig along rails.

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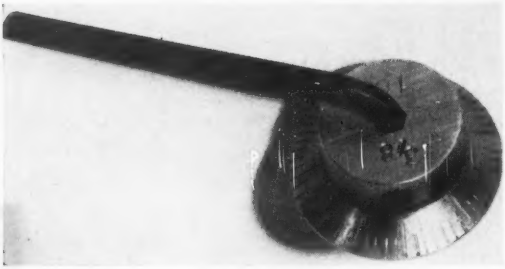

Dial-like guide for use with hex wrenches for recessed head screws. Dial graduations are so spaced for a thread of given pitch that a turn of one graduation provides an axial movement of 0.001 inch to the screw.

Dial-Like Guide Aids in Setting Up Tools

By Herbert Chase

MANY toolholders are equipped with screws for advancing or retracting tools in setting them up for various jobs. The usual procedure is to guess at the setting and then try the tool on a piece of work to see whether it cuts to size and, if not, how much off size the piece is. The tool must then be adjusted for the difference; however, without some guide, there is no way of telling when the adjusting screw has been turned the proper amount to set the tool in the correct position.

A special assignment man in an automotive transmission plant has devised the dial-like guide shown herewith which is designed to fit over hex wrenches used for socket head screws. The guide includes a cylindrical hub with a tapered flange and a hex hole at the center to accommodate a

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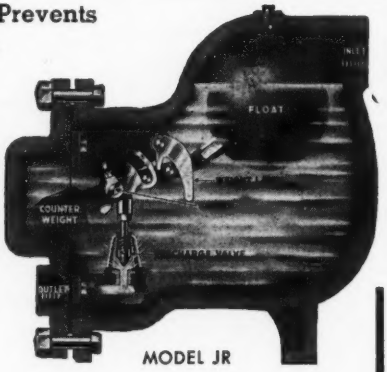

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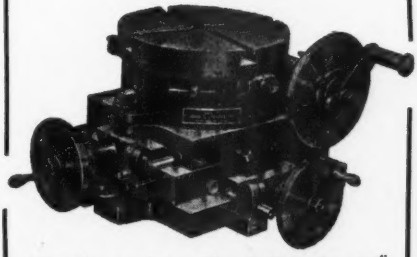

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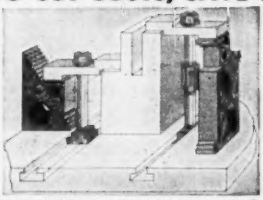

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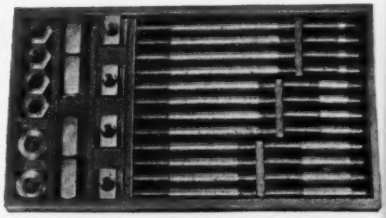

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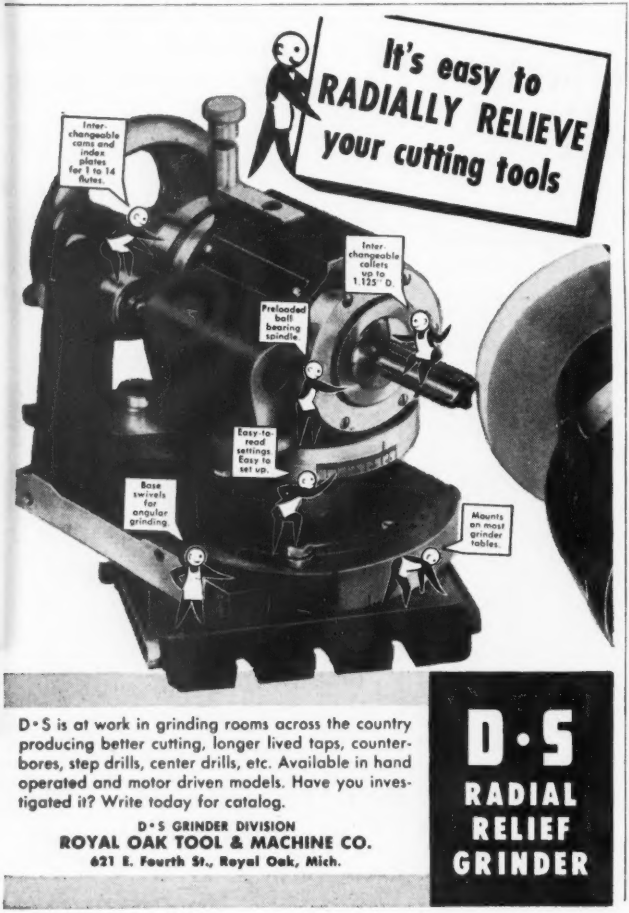
Ball and Roller Bearing Engineering. Published by SKF Industries, Inc., Philadelphia 32, Pa. 270 pages. Price, $1.75 (to individuals in the Continental United States).

Originally published in 1945, this manual, for the first time, is being made generally available to engineers, product designers, maintenance men, and engineering students. Regarded by the entire anti-friction bearings industry as one of the most authoritative works ever published on the subject, the manual covers in technical detail such subjects as bearing types and nomenclature, capacities, selection, design, installation, maintenance, causes of failure, and load calculations.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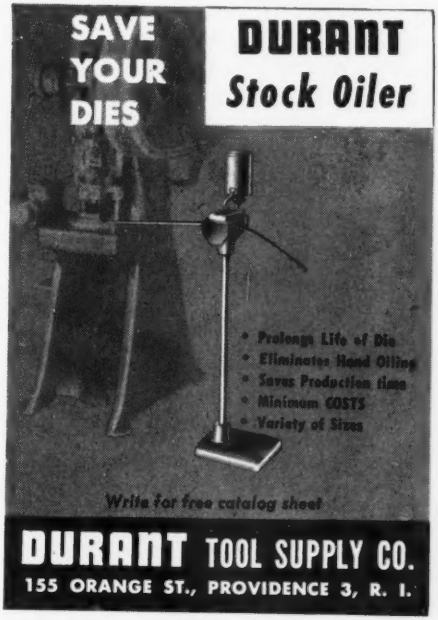

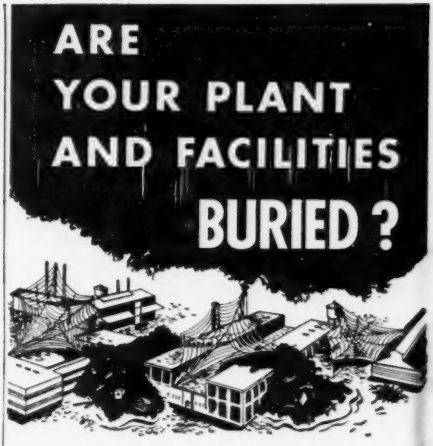

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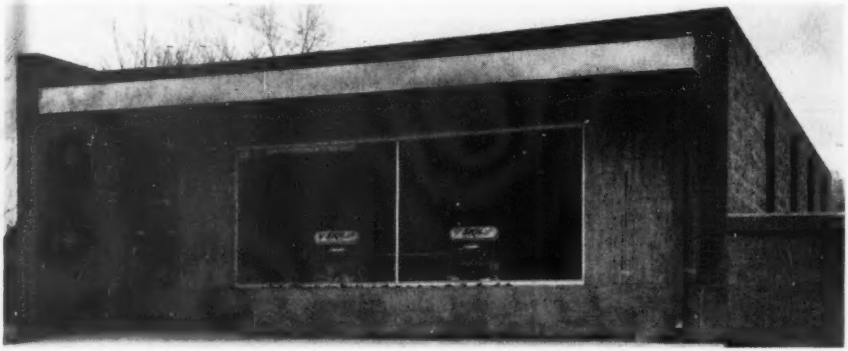
News of the Industry

Skilsaw Opens Additional Factory Sales and Service Branches

Paul Watts, vice president in charge of sales for Skilsaw, Inc., Chicago, Ill., manufacturer of portable power tools, has announced the opening of new factory sales and service branches in Milwaukee, Wisconsin, Denver, Colorado, and Spokane, Washington. This brings to 33 the number of Skilsaw sales and service branches throughout the United States and Canada and is part of the company's constantly expanding program of providing on-the-spot factory service to all industrial areas.

The Skilsaw branch in Milwaukee, located at 9209 Bluemound Road and managed by Walter Schroeder, occupies more than 2,400 square feet of floor space. Like its companion new branches in Denver and Spokane, it offers full factory branch service facilities, including factory-trained service mechanics, a complete stock of replacement parts and accessories for all Skil portable power tools, and space for display and demonstrations. Besides Milwaukee, this branch serves a large territory, including Racine, Kenosha, Fond du Lac, Oshkosh, Appleton, Madison, Green Bay, and Manitowoc, all in Wisconsin, and Escanaba and Iron Mountain in Michigan.

Skilsaw's Denver branch, located at 4462 York Street and managed by Edward Watwood, occupies 2,200 square feet of floor space. Its service territory beyond Denver includes Colorado Springs and Pueblo in Colorado, Ogden and Salt Lake City in Utah and Albuquerque and Sante Fe in New Mexico. The company's Spokane branch, located at 2226 North Division and managed by Byron Hoffman, covers 1,800 square feet of floor space and offers factory service throughout eastern Washington, Idaho, and Montana.



Factory Sales and Service Branch of Skilsaw, Inc., Denver, Colorado

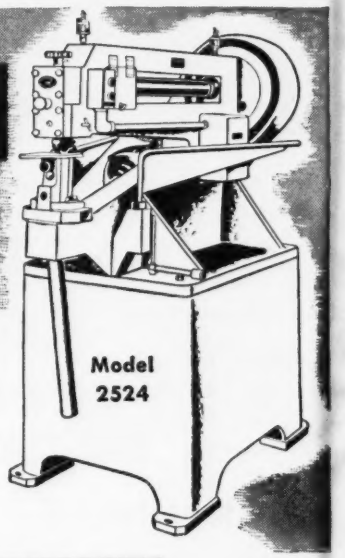
Plant Being Constructed for Manufacture of Large Precision Grinders

As a result of the urgent demands of the present arms program on many heavy machinery manufacturers, unusual attention has been focused on the double-head heavy-duty high-precision grinders developed by A. Harold Frauenthal, Inc., Muskegon, Mich., during World War II. To meet machinery builders' needs for these 2200 Series grinders, an 18½-acre tract has been acquired and a new plant of approximately 10,000 square feet is under construction.

Many of these huge grinders, reported to be the world's largest high-precision grinders, are now in service in a variety of industries. Their accuracy in handling large internal, external, and surface grinding, as well as light precision boring and turning, is said to make them suitable not only for the high precision that is vital in large gun mounts but also for machining heavy duty oil machinery, ponderous steel mill equipment, complicated paper-mill units, rugged road-building machines, excavators, hoists, crushers, bending machines, huge production units, and other industrial equipment.

Incorporators of A. Harold Frauenthal, Incorporated, are: A. Harold Frauenthal, designer of the 2200 Series grinder; Frank J. Donovan; and Mrs. Grace L. Frauenthal. David A. Walters is vice president and general manager. He was formerly works manager of the Tyson Roller Bearing Co., Massillon,

CAMPBELL
NIBBLING
MACHINES



Cut odd shapes from sheet stock *faster—*

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• For ferrous or non-ferrous metals. Work feeds in any direction. Many models, all re-engineered...ready for the emergency.

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AMERICAN CHAIN & CABLE
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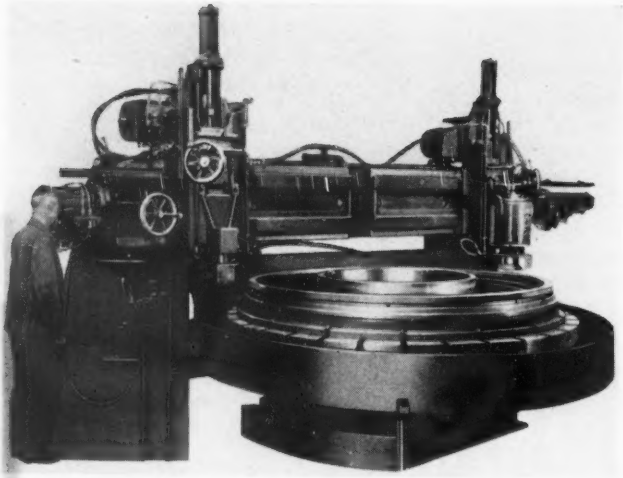


Illustration showing type of high-precision grinder to be manufactured in a new plant now under construction by A. Harold Frauenthal, Inc., Muskegon, Michigan

Ohio; chief works manager and assistant to the president of the Timken Roller Bearing Co., Canton, Ohio; staff engineer of the Trundle Engineering Company; and consulting engineer in Cleveland. Both Mr. Frauenthal and Mr. Donovan will continue to be active in the corporation's management while also retaining their positions of chairman of the board and president, respectively, of The Kaydon Engineering Corp., Muskegon, Michigan.

CHICAGO

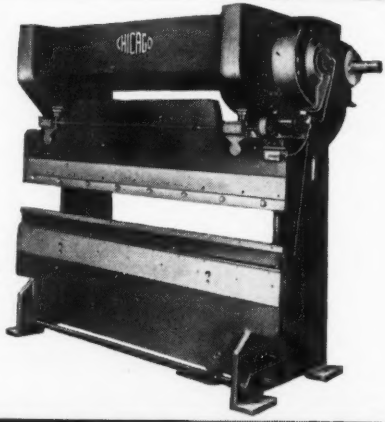
STEEL

PRESS BRAKES

43 Standard Sizes

Readily adapted for a wide variety of bending, forming, drawing, notching, blanking, punching, embossing, etc.

DIES Complete Line of Induction Hardened Dies for All Makes and Sizes of PRESS BRAKES.



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Cut Boring Costs

Boring
C'Boring
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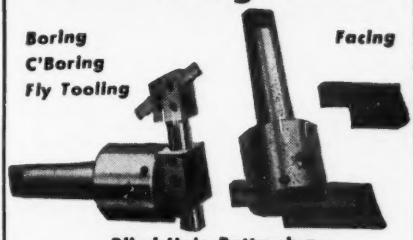

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Many enthusiastic users report that the Behr Boring Bar actually pays for itself in the first four weeks of operation. Just ask the man who uses one.

This proven, patented bar is chatter proof, extremely accurate and ultra efficient. Has interchangeable blades and accessories.

It is unequalled for versatility and efficiency.

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WARREN, MICHIGAN

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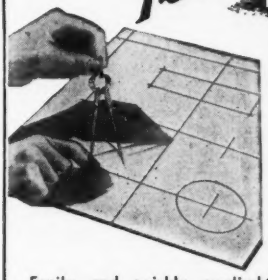

for LAYOUT WORK OF ALL TYPES... ON ALL METALS

Easily and quickly applied ● Dries instantly ● Sticks to any dry, clean surface ● Not affected by oil, water, coolants, etc. ● Easy to remove ● Will not blur, smudge, chip or peel ● Long lasting ● Low cost ● Economical.

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PENINSULAR CHEMICAL PRODUCTS COMPANY
6795 EAST NINE MILE ROAD
VAN DYKE ★ MICHIGAN

Buy KIPP AIR GRINDERS Because

The RPM's stay up while grinding... not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind — not just rub. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MODEL JA
50,000 R. P. M.
$42.00
IN U. S. A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

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208 Waubesa St., Madison, Wis., U.S.A.

- Skilled in DIE CASTING Mechanics
- Experienced in LUBRICATION Engineering
- Originators of Really High Speed AIR TOOLS

A. S. A. Approves Inspection Standard for Fine-Pitch Gears

The American Standards Association has announced approval of a standard for Inspection of Fine-Pitch Gears, B6.11-1951, covering general gears; spur and helical gears; worms and worm gears; bevel gears; backlash in gears; comparator layouts; gear blanks for fine-pitch gears; pin measurements; fine-pitch master gears; and surface roughness of gears. Fine-pitch gears are defined as gears of 20-diametral pitch and finer.

The new standard is based on a combination of the A.G.M.A. standards; however, a completely new section on surface roughness requirement for gears has been included. The recommended maximum roughness height values range from ½ to 1,000 microinches and the recommended maximum waviness height values from 0.00002 to 0.020 inch. Also included are definitions; specification of roughness width, waviness width, height of roughness and waviness, and lay; measurements or evaluation of roughness; surface symbols; symbols indicating direction of lay; and symbols indicating gear tooth zone.

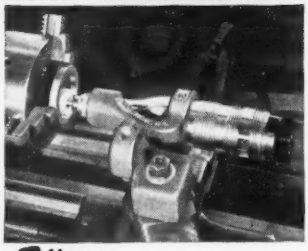
The standard is part of the gear standardization program developed by a committee organized under the procedure of the American Standards Association and sponsored by the American Gear Manufacturers Association and the American Society of Mechanical Engineers. Copies of the standard

ACCURACY TO .0001"

FOR TOOL ROOM AND PRODUCTION

FOR LESS THAN $150

IN PRECISE MOUNTS ON LATHES AND OTHER MACHINE TOOLS, PRECISE GRINDER-MILLERS WITH 1/4 H.P. AND SPEEDS FROM 20,000 TO 45,000 R.P.M. DO THE WORK OF SINGLE-PURPOSE MACHINES COSTING 100 TIMES AS MUCH!



VERSATILITY. For cylindrical, internal, external and form grinding; for milling with H. S. steel or **tungsten carbide** midget mills; for micro-finishing and polishing. Use on wood, glass, rubber, plastics, or any metal including the hardest alloy steel.

DURABILITY. All metal housing, rigid PRECISE quill, lubricant-sealed, micro-precision bearings 1/4 H. P. AC-DC motor (115 volts) is protected by replaceable fusetrons.

ATTACHABLE COOLFLEX SHAFT (optional). Quickly attached for bench work and handtool applications. Same speeds, same precision quill as in PRECISE GRINDER-MILLERS.

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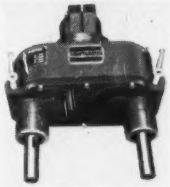
PRECISE GRINDER-MILLERS

Performance Proved!
THRIFTMASTER
Gear Driven Eccentric Type
Adjustable **DRILLHEADS**



- Rugged FULL BALL BEARING Construction—hardened parts used throughout.
- 31 STANDARD MODELS—to fit a wide variety of specifications.
- DRILLING CAPACITIES—from No. 60 to 1½" in Steel — rated to drill disintegration.
- FULLY ADJUSTABLE—from 1" min. to 14.2" max.—2 to 4 spindles.
- For Drilling, Reaming, Tapping and other machining operations.
- Prompt Delivery on Standard Heads.

. . . . . .

Full Line of Standard Universal Adjustable and Special Fixed Center Drillheads . . . Automatic Reverse Tap or Drill Units. Write for the Thriftmaster Catalog.

THRIFTMASTER PRODUCTS CORPORATION
1034 N. Plum St., Lancaster, Pa.
also Makers of
DORMAN AUTOMATIC REVERSE TAPPERS
4 Sizes • Friction & Positive Drives
Capacity 2-56 to 2" in Steel

SMALL PRECISION PINS
Made to Blueprint
DOWEL • STRAIGHT
COUNTERSUNK • TAPER
±.0001" Accuracy
.030" to .125" Diam.
Up to 2" Length
Precision Centerless Grinding Since 1931

INQUIRY INVITED ON YOUR VOLUME REQUIREMENTS FOR

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6605 Cedar Ave., Phone: EN 3417, CLEVELAND 3, O.

At last! A LOW COST AUTOMATIC *No Snatch Horizontal* STOCK REEL

THE *JACO REEL*

Rotates at just the speed to suit punch press feed. No power needed. Stock is taken from center of coil which lies on turntable. Natural spring of uncoiling material develops torque sufficient to rotate the 30" diam. ball-bearing mounted platen. Will handle practically any resilient coiled material up to 6" wide. *WRITE Today for Details.*

U. S. Pats. Pending

JACO DEVICES, Inc., 102 High Street, Hingham, Mass.

City officials of Richmond, Indiana, attended the Natco 50th Anniversary Open House which was held May 21-22, 1951. Pictured here, reading from left to right, are: Leslie Williams, fire chief; Leo Tracy, councilman; Lucas Rohe, police chief; Lester Meadows, mayor; Rollf Wadman, asst. fire chief; Rex Rench, personnel director, Natco; Ed Ross, city engineer; Ather Reeg, city clerk; William Bockhoff, Natco; Roland Nusbaum, W.K.B.V.; E. E. Opel, Natco; C. E. Youngflesh, councilman; G. H. Hoelscher, judge; Robert Law, councilman; Harry W. Bockhoff, president, Natco; Lester Spencer manager, radio station W.K.B.V.; and Charles Beck, city building inspector.

are available from either the American Standards Association, 70 E. 45th St., New York 17, N. Y., or the American Society of Mechanical Engineers, 29 W. 39th St., New York, New York.

Natco Celebrates 50th Anniversary with Open House

In celebration of 50 years of service to industry (1901-1951), the National Automatic Tool Co., Inc., Richmond, Ind., manufacturer of multiple-spindle drilling machines, held open house on May 21-22. Over 7,000 visitors toured the Natco plant during these two days. One of the highlights of the tour through the plant included a visit to the new welding division addition where visitors were served coffee, orangeade, and doughnuts.

CAMS

Specially Designed
Exclusive Duplicating Process
ONE CAM OR A QUANTITY

Send Specifications for Quotation
L. G. SCHLECHT & SON, INC.
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FLYNN

FOR OVER 30 YEARS
THE PREFERRED
OFFSET BORING HEAD

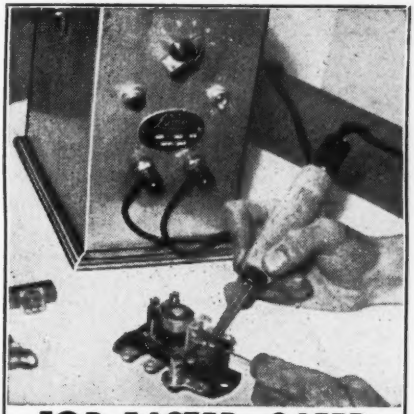
Write for Catalog

FLYNN MANUFACTURING CO.
133 FLOWERDALE AVE. • DETROIT 20, MICH.

GRANT **RIVETERS**

• Pioneers in the riveting field. Head rivets from smallest to ¾" diameter, either by noiseless spinning or vibrating hammer method.—Sizes to meet all needs.—Types include Vertical and Horizontal Multiple Spindles. *Write for literature—and don't forget to send samples.*

THE GRANT MFG. & MACHINE CO.
96 Silliman Ave. Bridgeport 5, Conn.

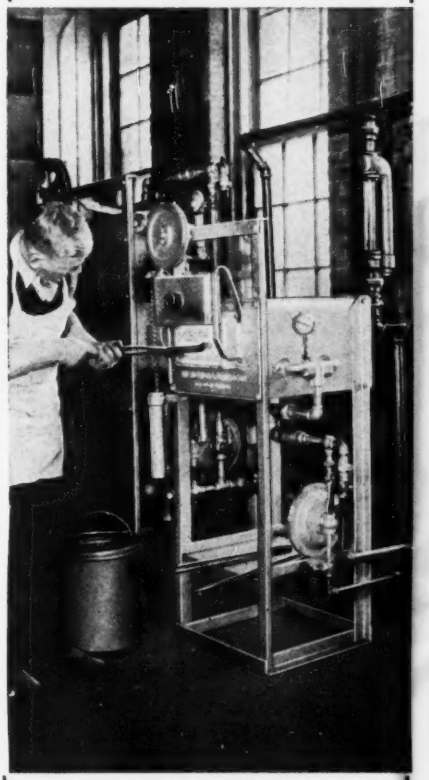


FOR FASTER, SAFER SOLDERING

The Luma resistance method of soldering is the accepted way for small shops requiring single operation to large plants with many types of operations. Write for complete information about this remarkable tool.

LUMA ELECTRIC EQUIPMENT CO.
P. O. Box 132-M.S. Toledo 1, Ohio

YOUR GAS
FURNACE



THE AGF NO. 16-F OVEN FURNACE IS ONE OF THE MOST WIDELY USED FURNACES IN SMALL & LARGE SHOPS.

CHAMBER SIZE—8" wide x 4" high x 14" long. Made by the "Pioneer" manufacturers of gas furnaces and heat-treating equipment.

Write for Bulletin No. 206, to—

AMERICAN GAS PIONEERS 1878 FURNACE CO.

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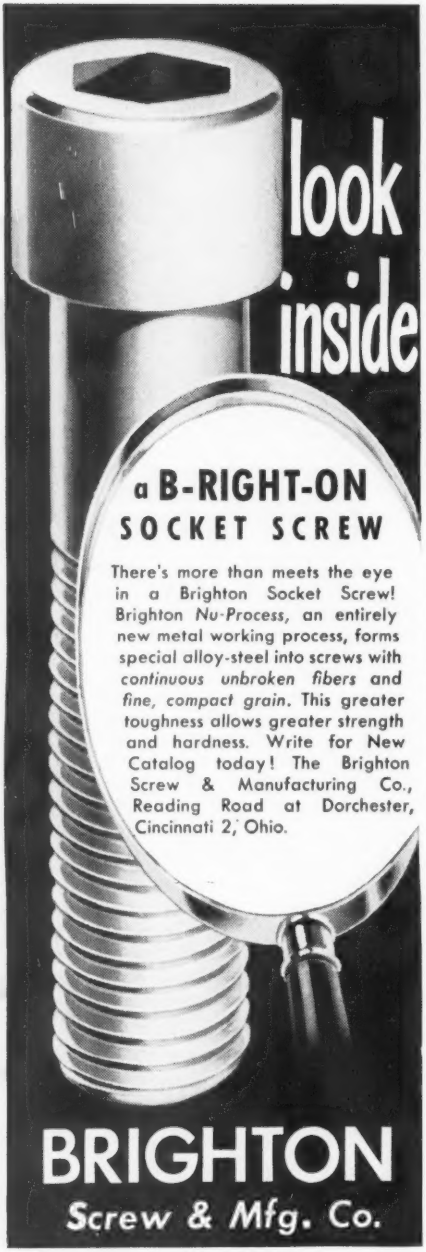
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a B-RIGHT-ON
SOCKET SCREW
There's more than meets the eye in a Brighton Socket Screw! Brighton Nu-Process, an entirely new metal working process, forms special alloy-steel into screws with continuous unbroken fibers and fine, compact grain. This greater toughness allows greater strength and hardness. Write for New Catalog today! The Brighton Screw & Manufacturing Co., Reading Road at Dorchester, Cincinnati 2, Ohio.
BRIGHTON
Screw & Mfg. Co.

Ready Tool Establishes Repair Service

The Ready Tool Co., 540 Iranistan Ave., Bridgeport 5, Conn., manufacturer of Red-E anti-friction bearing centers, has opened a repair service department to help alleviate the situation caused by shortages of vital materials and parts, plus the unusual demand for these precision centers. With this department, the company can accept all Red-E centers for repair, regardless of age or condition. Each center is reground to its original accuracy, regreased for life, and the bearings replaced with No. 5 A.B.C.E. specification bearings. Centers beyond repair will have a trade-in value.

New Manufacturing Plant Under Construction by Topflight Tool Company

Construction of a new manufacturing plant on a 3½-acre plot in North York borough was begun recently by the Topflight Tool Co., Inc., York, Pa. The one-story plant, which is expected to be completed before the end of the year, will have 16,000 square feet of working space and contain all of the latest features in lighting, heating, safety, and employee comfort. It will augment the factory which Topflight now operates in York and will provide greatly increased facilities for tool production and also for the subsidiary, Topflight Tape Company. Both Tool and Tape production departments are now located in the York factory. General offices of the Topflight Tool Company and Topflight Tape Company will remain at the center city location at 116 East Market Street.

Topflight produces aircraft production tools, hardness testers, riveting tools, and metal-working tools. Tool

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TOOLS and FIXTURES

Complete engineering and manufacturing facilities for your broaching applications. Expert service for sharpening and reconditioning your broaches. Standard keyway broaches in stock.

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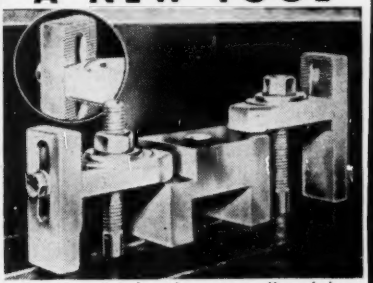
Dependable, Prompt Service

CONANT
Tool & Engineering Co.
347 WEST 107TH STREET
CHICAGO 28, ILLINOIS

A NEW TOOL



- Quickly switch from large to small workpieces without time wasting, tedious hunting of scrap shims. How? Easy with these drop forged, serrated clamps. Holds work up to 6" high.
- Set contains crosspieces (2 plain, 2 goosenecks) and uprights (2 each of 2", 3", 4" and 6"). Crosspiece take up to ⅝ T Bolts. **$19.50.**
- **FOR 10 DAY FREE TRIAL MAIL AD TO:**

MONTGOMERY & CO., Inc.
Since 1876
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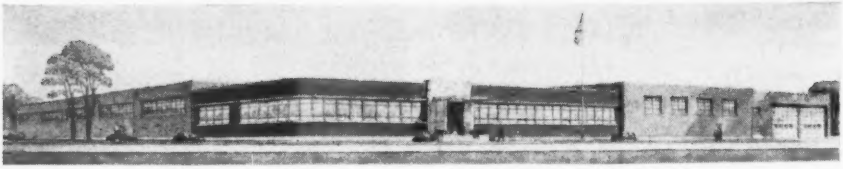
"...it's the bushing that makes the wHOLE difference"

To maintain maximum accuracy in drilling operations, use the bushing that's precision made for the job . . . use Acme! Write for catalog.

Accurate
Interchangeable
Concentric

Acme Industrial Company
Makers of Hardened and Ground Precision Parts
212 N. LAFLIN ST., CHICAGO 7, ILLINOIS

THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS



Architect's drawing of new plant of W. R. Brown Corp., Chicago, Illinois

design and engineering for special work and contracts is another phase of the company's activity. Topflight Tape Company produces a large line of pressure-sensitive tapes of cellulose, cloth, and paper.

W. R. Brown Corporation Builds Modern Plant

W. R. Brown Corporation, manufacturer of spraying equipment, has announced the opening of a new plant at 2701 North Normandy Avenue, Chicago, Illinois. The new building marks the company's fourth major expansion since its founding in 1921. It embodies complete, modern production facilities, all on one floor. From die casting to assembly to shipping department, the entire operation has been streamlined for smooth, even flow and maximum efficiency.

In addition to the Speedy Sprayer, the company manufactures a complete line of compressors, air guns, air filters, air regulators, pressure paint rollers, and air vises.

SINGLE & MULTIPLE SPINDLE
DRILL PRESSES!
15" HEAVY DUTY PRODUCTION MODELS STANDARD IN 1 TO 6 SPINDLES
Dozens of exclusive Darra-James design and engineering features. Investigate this complete line and compare.
WRITE FOR BULLETIN D.P. 51 — SPECIFICATIONS AND PRICES — NO OBLIGATION.
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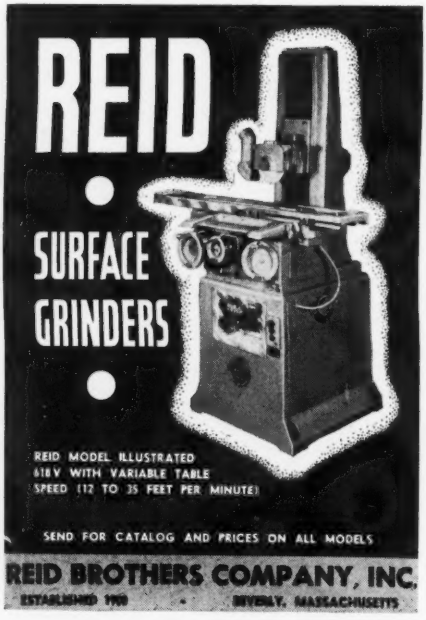
CORPORATION
SPRINGFIELD, MASS., U.S.A.
Darra James
POWER TOOLS


REID
SURFACE GRINDERS
REID MODEL ILLUSTRATED
618V WITH VARIABLE TABLE
SPEED (12 TO 35 FEET PER MINUTE)
SEND FOR CATALOG AND PRICES ON ALL MODELS
REID BROTHERS COMPANY, INC.
ESTABLISHED 1910 • BEVERLY, MASSACHUSETTS

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
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CAMS

Our ROWBOTTOM cam cutting facilities are at your disposal for your cam requirements.
We Solicit Your Inquiries.
BLOOMFIELD TOOL CORP.
37 FARRAND ST. BLOOMFIELD, N. J.

ALLIGATOR

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FILES

Over 4,000 shapes, cuts and sizes of **both** Swiss and American patterns.

Get **all** your files from one source.
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Carson - Newton Co.
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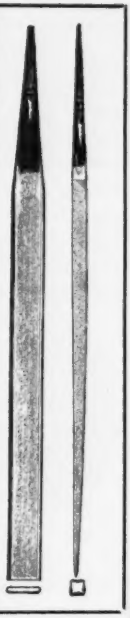
BELLEVILLE, NEW JERSEY



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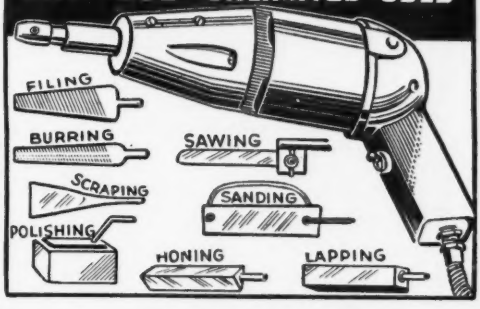
BETTER FINISHING

ONE TOOL - UNLIMITED USES



Use these PORTABLE, ELECTRIC RECIPROCATING TOOLS to cut out many tedious hand filing and finishing operations — Increase Production — Produce Uniform Work.

Light in weight — Deliver 1/8" or 3/8" fixed strokes at 1000 strokes per minute— Operate on 110 Volts AC-DC.

ACME TOOL COMPANY

73 WEST BROADWAY **NEW YORK 7, N. Y.**

Nu-Matic Grinders, Incorporated Moves to Cleveland

Nu-Matic Grinders, Incorporated has moved from Detroit, Michigan, to 8224 Carnegie Ave., Cleveland 3, Ohio. The concern is being managed by Arthur Raske, executive vice president. Newly appointed, Mr. Raske was formerly district sales manager of The Brush Development Company, Cleveland.

Founded three years ago by two Detroit businessmen, Nu-Matic Grinders, Incorporated markets a grinder head consisting of a pneumatic rubber drum that can be inflated to low air pressure (3 to 10 lb.) for grinding irregular and contour surfaces, as well as flat surfaces. Mr. Raske states that company plans for the immediate future include increased production to accommodate the constantly expanding demand for its product, appointments of more distributors and sales representatives, and a new comprehensive plan for national advertising.

Arthur Raske

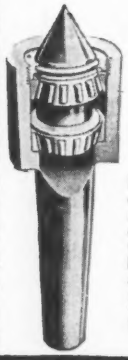
MAKE 3 HAMMERS AT ONCE

Mold your own Lead Hammers on a PRODUCTION SCALE with a Shur-Grip Handle and Cook Production Mold. *Write for Circular.*
Vises, Hammer Molds, Handles

LAWRENCE H. COOK, INC.
67 Massasoit Ave. E. Providence 14, R. I.

Quality...Accuracy... Long Service with

FALLS ROTO CENTER



You get the foremost design and construction features in the Falls Rotor Center—features so important in providing extreme accuracy and high load carrying capacity. Two Roller bearings. Accuracy of .0002 total indicator reading on spindle runout, exclusive adjustment feature to maintain accuracy, highest quality steel—these and other advantages are detailed in Bulletin 105 "LIVE CENTER FACTS." Write for it today.

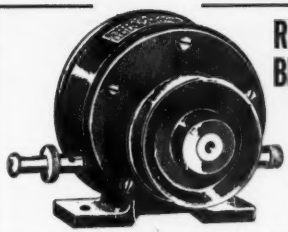
FALLS PRODUCTS, Inc.
124 Genoa St. Genoa, Ill.

A S. M. Selects New Officers and Trustees

At the annual meeting of the nominating committee, the American Society for Metals named the following to serve as officials and trustees for the 1951-52 term: For president: Dr. John Chipman, head, Department of Metallurgy, Massachusetts Institute of Technology. (A past trustee, Dr. Chipman is now serving as vice president.) For

DRILL and PILOT BUSHINGS
Frictionless —Rotary
For core drilling, T. C. and high speed boring, turret tool, piloting, etc. Won't stick or clog. Dust proof as a watch. *Write for details.*

GATCO ROTARY BUSHINGS CO.
1300 Mt. Elliott Ave. Detroit, Mich.



ROTARY BLOWERS for BLOW TORCHES

Send for Circular

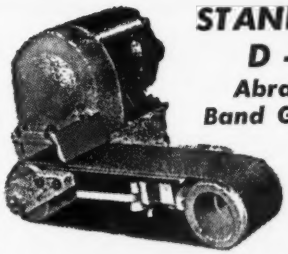
BUFFALO DENTAL MFG. COMPANY
Buffalo 3, N. Y.

CAMS

A **complete** cam cutting service for both large and small cams is offered by our **ROWBOTTOM** and **DALY** cam milling facilities.

May we quote **YOU?**

BLAIR TOOL AND MACHINE CORP.
119-03 15th Ave. College Point, L. I., N. Y.



STANDARD D - 4 Abrasive Band Grinder

Famous for Stamina

This new, streamlined bench type grinder, assures fast, quality finishing on metals, plastics, wood, fibre... at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY

WALLS SALES-CORP.
333 Nassau Avenue, Brooklyn 22, N. Y.

NOW there are THREE in the WALTON FAMILY

The Walton Company has added *Walton-American Tool Holders* to its line of time- and labor-saving tools — the well known *Walton Tap Extractor* and its companion *Reps Pipe and Stud Extractor.*

WALTON TAP EXTRACTORS

Universally used for removing stubborn, balky taps that break off deep in threaded work. Quick, easy, inexpensive. Will not damage threads.

WALTON-AMERICAN TOOL HOLDERS

Many holders in one. Head will swivel around an entire circle. May be set for straight, right or left-hand offset positions. Will hold with perfect grip any size square or round tool bit or boring bar.

REPS PIPE AND STUD EXTRACTORS

When faced with broken pipes or studs that defy movement—here's the tool. Makes a strong, four-point grip without need for hammering or pounding. Hardened steel—will remove any material.

SEND FOR NEW CATALOG OF WALTON TOOLS

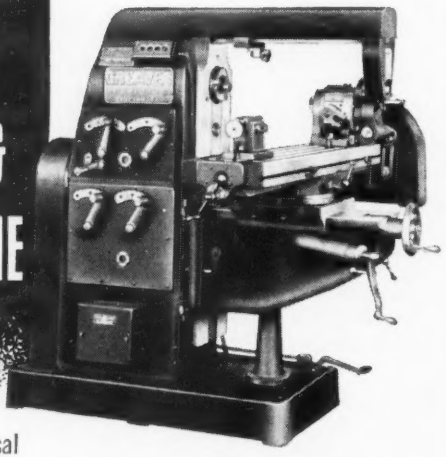
THE WALTON COMPANY
Dept. 10, Hartford 10, Conn.
Please send your new catalog of Walton Tools with full details of free trial offer.

Name .....
Street .....
City ..... State .....

vice president: Ralph L. Wilson, director of metallurgy, Timken Steel and Tubes Division, Timken Roller Bearing Company. (Mr. Wilson is now completing the second year of a two-year term as society treasurer.) For treasurer: Ralph L. Dowdell, head, Department of Metallurgy, University of Minnesota. For trustee (new): George A. Roberts, chief metallurgist, Vanadium-Alloys Steel Corporation. For trustee (new): J. B. Johnson, chief of Materials Division, Wright-Patterson Air Force Base, Dayton, Ohio.

The A. S. M. board of trustees for 1951-52 will include, in addition to Messrs. Roberts and Johnson, the following members; J. B. Austin, director of Research Laboratories, U. S. Steel Co., Kearny, N. J. (present trustee); Dr. James T. MacKenzie, chief metallurgist, American Cast Iron Pipe Co., Birmingham (present trustee); Walter E. Jominy, staff engineer, Chrysler Corp. (will serve as A. S. M. vice president); Dr. John Chipman, head, Department of Metallurgy, Massachusetts Institute of Technology (will serve as A S. M. president); Ralph L. Wilson, director of metallurgy, Timken Steel and Tubes Division, Timken Roller Bearing Co. (will serve as A. S. M. vice president); W. H. Eisenman (will serve as A. S. M. national secretary); and Ralph L. Dowdell, head of the Department of Metallurgy, University of Minnesota (will serve as A. S. M. treasurer).

GREAVES NO.2-H MILLING MACHINE



plain or universal

offers every modern milling machine advantage:

18 spindle speeds (20 to 1000 rpm), 18 feeds (½" to 30" per minute), rapid traverse, Timken bearings and many others.

you can't buy a better combination of simplicity, rugged construction, ease of operation, accuracy and production speed. **send for bulletin** and price list.

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STOP DUSTS *with* DUSTKOP

22 different Dustkops — 300 cfm to 10,000 cfm

available from stock.

. . . . dusts from,

- **Surface Grinders**
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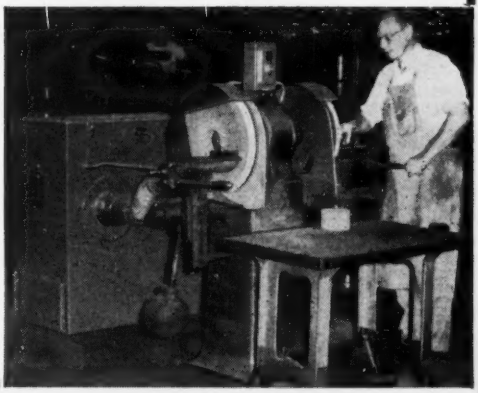
. . . any industrial dusts.

Send now for new Catalog 605b. Describe dust problem for recommendation by return mail; no obligation.



AGET - DETROIT CO.
207 Main Street
Ann Arbor, Mich.

For Simplicity In OIL GROOVING!

The FISCHER No. 1 Oil Groover cuts a wide variety of grooves in bearings up to 8" in length and up to 5" inside diameter. A few simple settings permit you to cut continuous, relieved, straight or spiral grooves at any angle from parallel to perpendicular to the work. Grooves may also be cut in shafts, housings, etc.

This machine will slash grooving time and deliver continuous profitable production in your shop. It will pay to find out what it can do on your grooving jobs.

Write for Catalog.

Send parts for free grooving and production estimate

Fischer Machine Co.

Established 1900

316 N. ELEVENTH ST. — PHILADELPHIA 7, PA.

(Left to right) Arnold K. Brown, Daniel H. Haynes, and David S. Meiklejohn

AMF Elects Officers

American Machine & Foundry Co., New York, N. Y., has named Arnold K. Brown, formerly vice president and director of Brown and Sharpe Manufacturing Co., as executive vice president and director. Daniel H. Haynes, formerly AMF vice president and treasurer, has been elected vice chairman of the board of directors and chairman of the executive committee. Mr. Haynes is also president of the International Cigar Machinery Company, AMF affiliate.

David S. Meiklejohn has been elected treasurer of the company, succeeding Mr. Haynes. He was formerly assistant treasurer of the company.

Expansion Program Under Way at Crucible's Syracuse Plant

A $900,000 program to expand steelmaking and processing facilities of the Sanderson-Halcomb Works of Crucible

Economy's

CLOSE-TOLERANCE DRILL-JIG BUSHINGS AND GAGES MEET YOUR HIGHEST STANDARDS

All A. S. A. standard types and sizes are in stock, ready to fill your order. And if you need new gages or gages salvaged by hard chromium plating, you can also depend on fast delivery. Write for bulletin and price list.

Economy TOOL & MACHINE CO.

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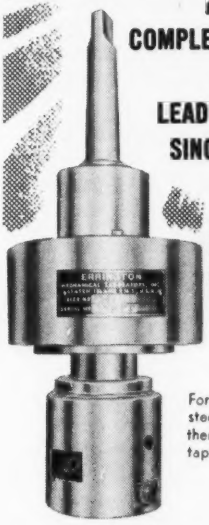
ERRINGTON TAPPERS . . .

the COMPLETE LINE . . . *the* LEADING LINE SINCE 1891



FRICTION

For blind holes, tapping in steel, copper, etc. wherever there is danger of breaking taps.

Errington specializes in the manufacture of high speed multiple drilling and tapping attachments. The name Errington is your assurance of top-quality products . . . your assurance of the finest and most modern tools to produce first-grade workmanship at minimum operating costs.

QUICK-CHANGE

Tool-Holders to Drill, Tap and Set Studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder, if required.

POSITIVE

For through holes where work is drilled and then re-handled and tapped.

BALL BEARING CONE-DRIVE

Designed for Ball Bearing High Speed Drill Press.

These Tappers may also be adapted for button or acorn die threading.

Write for Complete Information

ERRINGTON Mechanical Laboratory, Inc.

Established 1891

Main Office and Plant **STATEN ISLAND 4, NEW YORK**

NUMBERALL

CUTS THE COST OF STAMPING NUMBERS

Model 70

Multi-Wheel Numbering Machine

Machine and Shank All One Piece.

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL Machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20.

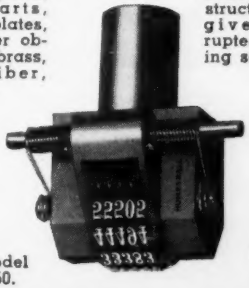
Write for Bulletin MS-70.

AUTOMATIC INDENTING NUMBERING HEAD • MODEL 50

Automatic indenting numbering head for consecutive or repeat numbering 1/32" to 3/8" high figures can be furnished in sharp face Gothic or shaded Roman figures. Can be used in foot or power presses.

Numbers: radio, airplane, tool parts, name plates, and other objects in brass, steel, fiber, plastics.

Heads are of sturdy construction and give uninterrupted marking service.

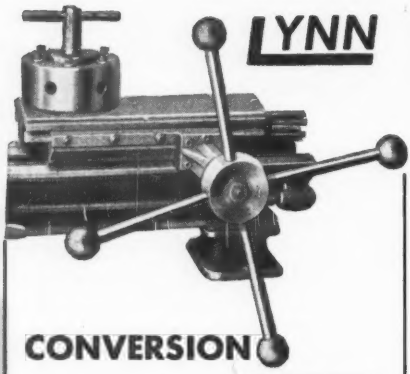


Model 50.

Write for Bulletin MS-50.

NUMBERALL STAMP & TOOL CO.

HUGUENOT PARK STATEN ISLAND 12, N. Y.



CONVERSION TURRETS
& CUT OFF CROSS SLIDES

Fast Delivery

Especially adapted for the following lathes:

Logan	**Craftsman**
Atlas	**Power Craft**
South Bend	**Clausing**

Sheldon

Large Turrets to Order

Convert your engine lathes for turret work. Put your idle or unproductive lathes into full-capacity production — *At Once.* **Lynn** conversion turrets are easily and quickly mounted on your present lathes—all set and ready for full-capacity, close-tolerance production, just like new turret lathes, but at a small fraction of the cost.

Machine Tool Division

LYNN

Write, Wire, Phone

MANUFACTURING CO., Inc.

1121 So. Seventh St., Minneapolis, Minn.

Steel Company of America, Syracuse, N. Y., has been announced by W. H. Colvin, Jr., president. Employing some 3,000 persons and producing tool, high speed, stainless, high alloy, and super alloy steels, Sanderson-Halcomb is one of the largest plants of its kind in the world. An additional electric furnace is being installed in the melting shop of the plant to increase its melting capacity for alloy, super alloy, and other special purpose grades.

The wire mill of the Sanderson-Halcomb Works is being expanded by auxiliaries to speed and improve cold finishing operations on coils, small bars, and precision-finished wire products. In the bar finishing department, additional installations include a large circular saw, centerless grinding machine for bars, and polishing equipment. Expanded capacity for cogging will be obtained by additional ingot heating pits. Expanded facilities are also being provided for billet and bar annealing, and the electric power distribution system of the plant is being improved.

Centric Clutch Expands Facilities

To meet the rapidly growing acceptance and demand for its Rawson centrifugal clutch-couplings for solving drive problems, the Centric Clutch Company has moved into a newly completed building at the junction of Main Street and Route 35, Woodbridge, New Jersey. The new plant is a one-story modern type structure with approximately 10,000 square feet of floor space. This is a four-fold increase over the previous facilities at Cranford, New Jersey. The company plans to expand its staff of engineers, sales representatives, and factory personnel to handle orders and to maintain prompt shipments and deliveries.

Two Ex-Cell-O Executives Promoted

Following the regular meeting of the board of directors of Ex-Cell-O Corp., Detroit, Mich., H. Glenn Bixby, president, announced the election of two new officers. Donald H. McIver was elected to the office of vice president in charge of industrial sales, and George D. Scott was elected vice-president in charge of Pure-Pak sales.

Donald H. McIver (left) and George D. Scott

Mr. McIver, who was formerly sales manager of the Industrial Division, joined Ex-Cell-O in 1929 and embarked upon an intensive two-year training program. In 1931, he was put in charge of the production control department until, in 1934, he moved to the sales department. He was made assistant to the vice president in charge of sales in 1937, and ten years later was promoted to sales manager of the Precision Products Division. In 1949, Mr. McIver was made sales manager of the Industrial Division of Ex-Cell-O.

Mr. Scott was formerly sales manager of Ex-Cell-O's Pure-Pak Division. Prior to his affiliation with Ex-Cell-O, he worked in executive capacities in the Pontiac and Buick Divisions of General Motors, following which he was general manager of a Detroit

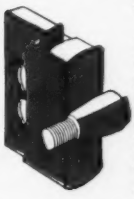
A BETTER BORING BAR

OUR fine list of Customers is PROOF that our method of broaching square holes makes a better fit for the tool bit. This means more rigidity and longer life especially with tungsten Carbide. We also make bars for our Type B and Type C cutters or a combination of tool bits and cutters. Bars are made to suit customers' requirements as to method of drive, pilot, number of holes, angle of bit, etc. Our two-bladed cutters can be floated in the bar or held rigidly. Cutters are interchangeable—hence can be ground in an arbor in the tool room and only require a few seconds for inserting in the bar.
Square hole sizes range from ¼" up to and including ¾".

THE DETROIT BORING BAR CO.
688 E. FORT ST. Detroit 26, Mich.

Established 1927

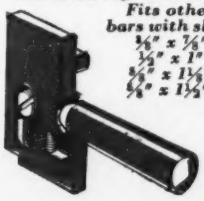
TYPE "B" AND "C" CUTTERS
Suitable for Tipping With Tungsten Carbide

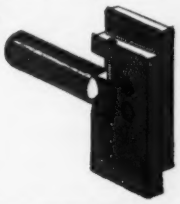


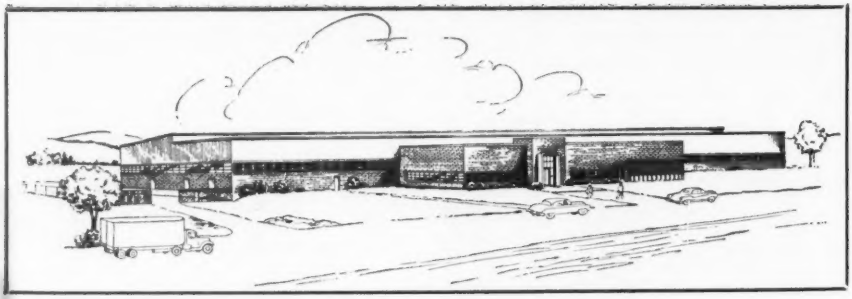
"B" *A strong rigid serrated 2-bladed cutter—located in the bar with a taper pin. Bores holes accurately to close limits. Can be expanded and reground giving long life. Sizes ⅞" dia. up to 6".*

"C" *A simple 2-bladed reaming cutter. Can be expanded and reground. Located in the bar by a hardened V. This V never has to be reground as blades are expanded.*

Fits other bars with slots
⅜" x ⅞"
½" x 1"
⅝" x 1⅛"
⅞" x 1½".





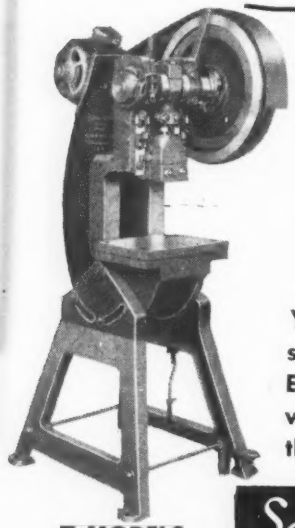


Sketch of new grinding machine manufacturing plant to be erected by Norton Company in the Greendale section of Worcester, Massachusetts

manufacturing concern. In 1936 he joined Ex-Cell-O as the corporation's sales promotion manager, and a year later was made sales manager of the Pure-Pak Division. In this capacity he has worked closely with the Pure-Pak engineering, research and service departments.

Norton to Construct New Grinding Machine Manufacturing Plant

To meet demands of the present defense effort, a new 6½-acre plant for the manufacture of grinding machines will be erected by the Norton Company on Brooks Street just south of the Pullman-Standard Car Manufacturing



Get MORE from your MATERIAL

Specify

PRESS-RITE

No. 1½ - 15 Ton

POWER PRESSES

You're sure of higher production and reduced scrap when you install Press-Rite Power Presses. Extra heavy frame and crankshaft. Triple ramway lubrication. Available with longer stroke than standard, at small additional cost.

7 MODELS
5 to 85 Ton
Write for bulletin P650 today!

Sales Service Machine Tool Co.

PRESS-RITE PRESSES · SHAPE-RITE SHAPERS · KELLER POWER HACK SAWS

2355 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

Company property in the Greendale section of Worcester. The new plant will consist of a 740 x 300-foot factory joining a 360 x 100-foot office building. A large parking area will adjoin the plant site.

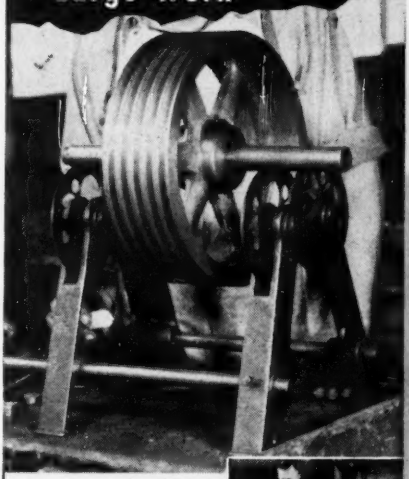
Of single-story modern construction, the unit will provide 275,000 square feet of working space and enlarge the company's machine tool manufacture by 50 to 60 per cent. Present facilities of Norton's Grinding Machine Division on New Bond Street will continue to be utilized, at least during the present emergency.

The most modern design techniques known to machine tool production will go into the new plant. Sixty-foot bays will accommodate straight-line production methods which will funnel all manufacture and sub-assemblies to an erecting floor toward the rear of the plant adjacent to painting, packing, and shipping sections. A 15,000-square foot mezzanine will house locker rooms, wash rooms, and an electric power sub-station. The entire unit will be fluorescent lighted and the factory fully ventilated for both summer and winter. Acoustical ceilings and air conditioning are planned for the office building which, in addition to production, sales, engineering, and administrative offices, will contain complete cafeteria and kitchen facilities for factory and office personnel.

Carboloy Company Becomes Department of General Electric

Effective June 30, 1951, The Carboloy Co., Inc., Detroit, Mich., became the Carboloy Department of General Electric Company. K. R. Beardslee, who has been president of the Carboloy Company and will continue as

Balancing Tools for Small, Medium or Large Work



Checking balance of lathe spindle.

Sundstrand offers a complete line of balancing tools which will save their cost quickly on truing or balancing operations. Accurately sensitive and durable, they provide a simple, reliable means for checking the balance of parts like gears, shafts, fly wheels, pulleys, etc. Standard swing sizes range from 21 inches up to any swing desired. Length between standards ranges from 20 inches to any length desired.

FREE DATA You can obtain complete information on Sundstrand Balancing Tools by writing for bulletin 510.

SUNDSTRAND

SUNDSTRAND MACHINE TOOL CO.
2539 Eleventh Street, Rockford, Ill., U.S.A.

general manager of the new G. E. Department, revealed that the corporate shift is in line with a vast potential expansion of the activities, capacity, and products of the Carboloy organization. According to Mr. Beardslee, the change, which to all practical purposes does not affect the company's suppliers, district offices, or distributors, or its present marketing and purchasing procedures or present management personnel, will materially facilitate expansion of overall Carboloy Department activities.

Gray Iron Announces 1951 Redesign Contest

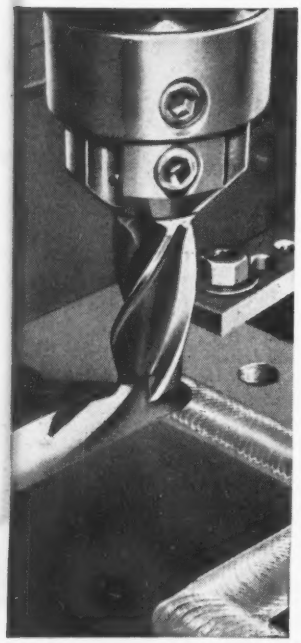
Gray Iron Founders' Society, Inc., 210 National City-E. 6th Bldg., Cleveland 14, Ohio, has announced the opening of its 1951 Redesign Contest. The award program gives recognition to those who submit the best examples of the redesign of component for production in gray iron.

Prizes totaling $350 will be given this year to the top three winners. First award is $200. The award program is open to all engineers, designers, or other interested persons, whether or not they are employees of member companies. Last year's winners were Arthur W. Palm, sales representative, Olney Foundry Division, Link Belt Co., Philadelphia, first prize; and R. A. Bogardus and J. D. James, chief of

YESTERDAY'S PIONEER . . . TODAY'S LEADER

NEW HEAVY DUTY END MILLS and HOLDERS

(Both are Stock Items)



● Look at this rugged 2″ diameter Weldon end mill with 4″ long flutes which made a 2½″ deep cut in a solid block of die steel—4140 steel heat treated to 260 Brinnell. The feed was 1½″ per minute, and the material was removed at a rate of 7½ cubic inches per minute.

This HEAVY DUTY Weldon end mill is held by a new-style end mill holder which bolts securely on to the nose of the milling machine spindle. The holder, located by a centering plug, is driven by two drive keys on the spindle nose. The 2″ diameter shanks of these heavy-duty end mills are securely held by two large hollow head screws.

For top performance and sturdy long life in end mills—large or small—look to Weldon.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

SEND FOR LATEST CATALOG NO. 10

THE WELDON TOOL CO. Cleveland 4, Ohio

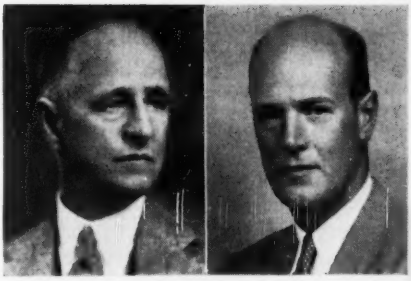
3000 WOODHILL ROAD

the Calculation Department and superintendent respectively, Cooper Bessemer Corp., Grove City, Pa., second prize.

E. P. Bullard Named Chairman Emeritus

At a recent meeting of the board of directors of The Bullard Co., Bridgeport, Conn., E. P. Bullard resigned as chairman of the board of directors. The board unanimously voted to name him chairman emeritus.

At the same meeting, a plan of reorganization was adopted by the board of directors and E. P. Bullard, III, who has been vice president in charge of manufacturing for the past ten years, was elected vice president in charge of engineering and development. He felt that he could not accept this position and resigned effective May 29, 1951. Mr. Bullard was an employee of



E. P. Bullard, Jr. (left) and E. P. Bullard, III

The Bullard Company for approximately seventeen years and has been responsible for the engineering and design of many of the new developments of The Bullard Company, including the Cut Master Vertical Turret Lathe, the Man-Au-Trol Vertical Turret Lathe, the Man-Au-Trol Spacer, the 34-Inch 4-Spindle Mult-Au-Matic and the Type K Mult-Au-Matic.

FIRST • FOREMOST • FINEST

Chicago Mounted Wheels

will save you Time and Money

Chicago Mounted Wheels really cut—don't just rub. They provide a custom-built product to fulfill virtually every kind of grinding and polishing operation. They speed up production—last longer—and cost less . . . with a variety of styles and sizes to cover every type of operation.

Offices and stocks in principal industrial centers.

Write for Free Catalog, plus details on Free Engineering Service.

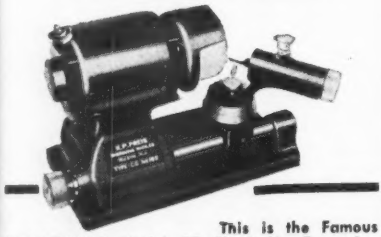
CHICAGO WHEEL & MFG. CO.
1101 W. Monroe Street, Dept. MMS
Chicago 7, Illinois

New Administration and Welding School Building Inaugurated by Eutectic

To consolidate and house existing branches of the company scattered in and about the New York metropolitan area, including the general and executive offices and the new Eutectic Welding Institute (an advanced brazing center for welders), a new, modern administration building has been constructed by Eutectic Welding Alloys Corporation at Flushing, New York. The structure covers an acre in the Auburndale section of Flushing adjoining the larger manufacturing plant erected by Eutectic last year.

Over two hundred persons were present at the dedication and inaugural ceremonies, including the Hon. Maurice A. FitzGerald, president of the Borough of Queens; Robert T. Norment, president of the Queens Chamber of Commerce; Dr. Robert Humphrey, past chairman of the American Society for Metals; Professor Otto H. Henry of the Department of Metallurgy, Polytechnic Institute of Brooklyn; and other leading civic and business officials. J. P. Hughes Wasserman, father of Eutectic's president and founder and a pioneer of the welding industry for nearly fifty years, came from Switzerland to attend.

PRECISION CUTTER GRINDERS



This is the Famous PREIS-PANTO Model CG Single-Lip Engraving and Routing Cutter Grinder. Surprisingly low in price because of the high-production basis of manufacture.

PANTO

Easy to use because of simplicity of design and SURE to give true centers on your cutters.

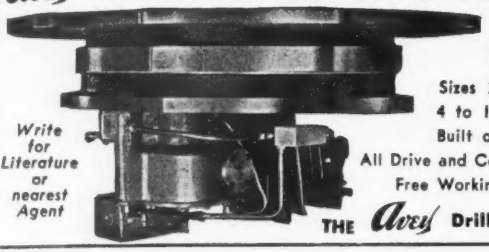
H. P. PREIS ENGRAVING MACHINE CO.

657 Route 29, Hillside, N. J.

Metal Trades Award

Joseph L. Kopf, president of the National Metal Trades Association has announced that its third Annual Award for outstanding achievement in the field of industrial relations will be made at the association's 52nd Annual Convention to be held September 26, 27, and 28 at the Palmer House, Chicago. Appointed to the committee to select

Avey AUTOMATIC INDEX TABLE Meets Demand for DRILLING and TAPPING EQUIPMENT



Sizes 24", 30", 36" Tables Interchangeable. 4 to 18 Indexes. Entire Unit Self-Contained. Built on Unit Construction Principle. All Drive and Control Mechanisms underneath Table for Free Working Surface • Easy Accessibility!

Write for Literature or nearest Agent

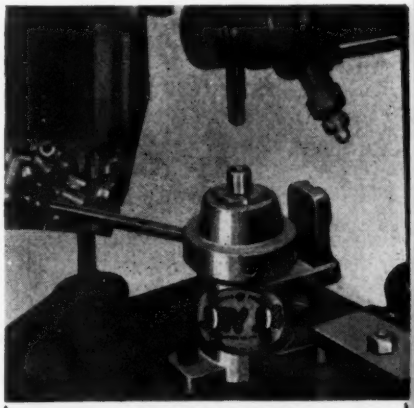
THE Avey Drilling Machine Co., Cincinnati 1, Ohio

the 1951 recipient of the award are: G. A. Waters, vice president, Wagner Electric Corp., St. Louis, Mo., chairman; Russell C. Ball, president, Philadelphia Gear Works, Philadelphia, Pa.; Howard Gambrill, Jr., vice president, Gillette Safety Razor Co., Boston, Mass.; H. F. Hodgkins, president, Lipe-Rollway Corp., Syracuse, N. Y.; and J. I. Schultz, vice president, National Broach & Machine Co., Detroit, Mich.

Inaugurated at the association's Golden Anniversary in 1949, the award, in the form of an inscribed plaque, recognizes the American citizen whose contributions in the field of industrial relations are deemed most important. The two previous awards were won by Louis Ruthenburg, chairman of the board of Servel, Incorporated, in 1949 and Harold S. Falk, president of the Falk Corp., Milwaukee, Wis., in 1950.

D. J. Murray Elects Officers and Directors

Following a recent stockholders' meeting, the board of directors of the D. J. Murray Mfg. Co., Wausau, Wis., reelected Fred C. Boyce as president to serve his 18th consecutive year in that capacity. Other officers elected were A. W. Plier, executive vice president and general manager; M. P. McCullough and D. C. Everest, vice presidents; C. L. Durkee, vice president and sales manager; George L. Ruder, treasurer; W. A. Marquardt, secretary; Grover Keeth, assistant treasurer; and P. W. Hoeper, assistant secretary. Messrs. Boyce, Everest, and McCullough were reelected for the 30th consecutive year as directors at the annual stockholders' meeting. Other directors reelected were Messrs. Plier, Hoeper, Keeth, Ruder, and Durkee.



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This fast, accurate, low-cost collet-type work holder speeds secondary operation drilling, milling, tapping, etc., either horizontal or vertical. • Guide bushing support (not shown) for cross hole drilling. • Spring ejector (optional) speeds work. • Simple, dependable, proven in service. Send for our folder.

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Vertical, Horizontal or Angular Mounting.
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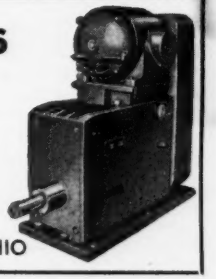


Boyar-Schultz Opens New Sales and Service Office

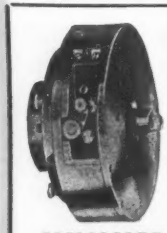
The Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill., has opened a new office for sales and service of its growing line of toolroom tools. Located in New York City at 401 Broadway, this new office will be under the management of Oliver J. Green and under the supervision of Ed. M. Baumruck, eastern sales manager. A complete line of Boyar-Schultz screw machine tools, copper head laps, and SMB machine bolts will be carried in stock for the convenience of Metropolitan New York users. Profile and surface grinders may also be sold and serviced from this office.

Ed. M. Baumruck (left) and Oliver J. Green

The long experience in the tool industry enjoyed by Mr. Baumruck and Mr. Green will be available to those interested in and users of Boyar-Schultz products.

Thor Employees Initiated into 25 and 50-Year Clubs

One hundred sixty-six employees with a combined service record of 5,038 consecutive years with Independent Pneumatic Tool Company, manufacturer of Thor portable power tools,



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For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheet, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

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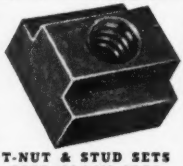

T-NUT & STUD SETS
STEP BLOCK SETS
PUNCH PRESS SETS

QUARTER TURN SCREWS
SHOULDER SCREWS
DOUBLE END JIG FEET
SCREW TYPE JIG FEET
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CUT THREAD STUDS
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COUPLING NUTS
ADJUSTABLE STEP BLOCKS
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Northwestern

119 HOLLIER AVE., DAYTON 3, OHIO

were recently initiated into the company's new 25 and 50-Year Clubs. One hundred forty men and women employed in the company's main works at Aurora, Illinois, attended the inaugural dinner held in the swank 21st floor Sky Club atop Aurora's Leland Hotel. Also honored but not present at the event were members from various Thor branches across the country and those persons who were unable to attend because of illness.

Two veterans were welcomed into the 50-Year Club; namely, William Large, toolroom machinist, now in his 58th consecutive service year, and Dominick Kellon, inspector, serving his 51st year. Neil C. Hurley, Jr., Thor president, served as toastmaster and awarded engraved "Golden Hour" electric clocks and charter membership certificates to all veterans, and television console sets to each 50-year veteran. Guests at the event in addition to Mr. Hurley included John A. McGuire, secretary, J. P. Bank, works manager, and Marshall J. Schultz, personnel director.

R. J. Cameron Elected President of Ross Operating Valve Company

Russell J. Cameron, formerly vice president in charge of sales, has been elected president of the Ross Operating Valve Co., Detroit, Mich. He succeeds John Sainsbury who will remain as an active consultant and member of the board of directors. W. E. Hennells has been named vice president and L. M. Blomgren, secretary and treasurer.

Members of the board have been reelected. In addition to the officers, they include M. E. Cameron, M. J. Thompson, and Mr. Sainsbury.

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A SPECIALIZED ROWBOTTOM CAM MILLING SERVICE... JIG BORING... SPOT WELDING... CONTRACT PRODUCTION ... EXPERIMENTAL DEVELOPMENT

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Write direct, if distributor cannot supply you.

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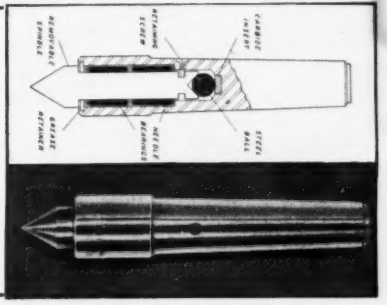


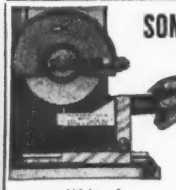
Kearney & Trecker Executives Promoted

Ralph W. Burk, vice president of sales for Kearney & Trecker Corp., Milwaukee, Wis., since 1943 has been elected vice president for manufacturing and will also continue as head of the company's sales division. The announcement was made by President Francis J. Trecker, who also announced simultaneously the appointment of Andrew K. Wilson as director of industrial relations and head of the personnel department. Mr. Wilson has also been made a member of the management committee.

Ralph W. Burk (left) and Andrew K. Wilson

Mr. Burk joined Kearney & Trecker in 1927 after 10 years with a Philadelphia dealer for the company. He also served as Detroit branch office manager, assistant division sales manager, and general sales manager prior to his election in 1943 to the sales vice presidency. Mr. Burk is a director of Amtea Corporation, an affiliate for sales of Kearney & Trecker machine tools in South America, and has served on several committees of the National Machine Tool Builders' Association since 1943.

Mr. Wilson was elevated to his industrial relations post from the managership of the company's process en-



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Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 8 sizes, from 1/8" to 3/4" U.S.S. Inexpensive — Last for years.

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Low Priced

3½" STROKE
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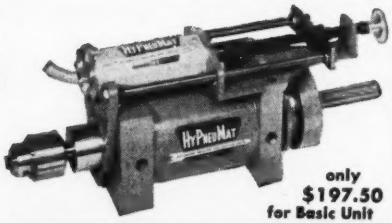
A few choice territories open for representatives



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gineering department. He joined the company in 1935 as an apprentice and has been, during his career, foreman of the grinding and thread milling department and personnel manager.

E. W. Miller Receives A.G.M.A. Connell Award

The American Gear Manufacturers Association through its Committee of Awards has announced that the 1951 recipient of the Connell Award is Edward Whitney Miller, who has been with the Fellows Gear Shaper Company continuously since 1898, having served as an apprentice, mechanical draftsman, chief draftsman, chief engineer, general manager, vice president, and currently as its president. Mr. Miller has been very active in the gearing industry throughout his entire business career and is the author of numerous articles on gear theory and the art of gear production. He has served the A.G.M.A. in many capacities, including that of president, which office he held for two consecutive years.

The Edward P. Connell Award has been made to Mr. Miller in recognition of the leadership he has displayed over the last 35 years in the development of sound principles in gear engineering. The Connell Award, which can be made annually by the American Gear Manufacturers Association, was established by The Falk Corporation in commemoration of the late Edward P. Connell, vice president.

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All types of mountings
TWO WHITON
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ASSURE LONGER LIFE
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Renewable hardened bushings at either end of pinions give long wearability and stabilize pinion end play.
Rigid individual process inspection and exhaustive tests after assembly guarantee chuck users the best in work holding.
If you have a work holding problem . . .
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Did You Know?---

Joseph L. O'Brien, sales manager of Doehler-Jarvis Corporation's Chicago Division, has been appointed consultant to the Office of Price Stabilization, Division of the Economic Stabilization Agency. Mr. O'Brien has been succeeded by **William L. Huber,** who was formerly a member of the sales staff of Doehler-Jarvis' Chicago Division.

The E. Horton & Son Co., Windsor Locks, Conn., has announced the appointment of **Donald B. Huntting** as sales representative for its line of chucks in the Cincinnati area.

—o—

The board of directors of Buckeye Tools Corp., Dayton, Ohio, manufacturer of portable air and electric tools, named **Albert G. Lauzon** as president and **Hal O. Gummere** as vice president and general manager during the annual board meeting. **Ervin Reeves** was named treasurer and **Earl Hamilton,** secretary. At the same time, **E. B. Meynard** was appointed sales manager and **Dave Thomas** was named plant superintendent.

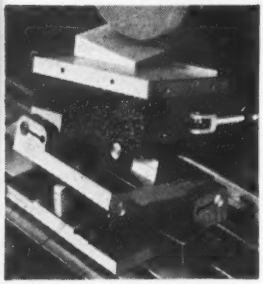
—o—

Len Becker, associated for the past 25 years with The Sterling Grinding Wheel Division, Tiffin, Ohio, has been appointed sales manager in the Cincinnati area for the Blanchard Diamond Tool Co., Chicago, Ill., producer of industrial diamond tools, laps, chip breakers, and saws, both standard and special.

ANGULAR SET-UPS

to gauge-block accuracy

IN A FEW MOMENTS



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Any angular set-up, single or compound, takes only the time to look up the angle in the Robbins Table of Constants and to insert the indicated gauge blocks between the Magna-Sine plates. It's fast—it's positive, to gauge-block accuracy. Work is held by magnetic attraction. In two models and two sizes; also in non-magnetic models for inspection work.

OMER E. *Robbins* COMPANY

Manufacturers of the MAGNA-SINE and Other Precision Tools

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Did You Know?---

Glen A. Wilson, formerly chief industrial engineer, has been appointed general superintendent of the Carbide Division of the Firth Sterling Steel & Carbide Corp., McKeesport, Pa. Mr. Wilson, who began his association with Firth Sterling in 1949 as industrial engineer, was formerly employed as plant industrial engineer at the Reynolds Alloy Co., Sheffield, Alabama.

—o—

Carl B. Christenson, excutive of Ready Tool Co., Bridgeport, Conn., has announced the appointment of **Kern and Collins, Incorporated** as its export manager in charge of the world-wide distribution of Red-E anti-friction centers, cemented carbide-tipped centers, high speed centers, toolholders, grinding machine dogs, and other allied tools.

—o—

The appointment of **Leo F. Hunderup** as vice president and assistant general manager of the Greenfield Tap and Die Corporation has been announced by Harry L. Bill, vice president and general manager. As executive vice president for many years of Van Norman Company and its subsidiary, the Morse Twist Drill and Machine Company, Mr. Hunderup has become a prominent figure in the machine tool and cutting tool industries, and in his new duties, will assist Mr. Bill in the management of the company's plants in Greenfield and the Geometric Tool Company Division in New Haven.

Did You Know?---

T. I. Phillips, vice president of the Westinghouse Electric Corporation and formerly in charge of the company's East Pittsburgh divisions, has been assigned to the staff of industrial products vice-president John K. Hodnette to help plan and carry out the company's extensive industrial products expansion program. **L. B. McCully** has been named general manager of the East Pittsburgh divisions in addition to his present duties as manager of the transportation and generator division.

— o —

Two Norton abrasive engineers have been transferred to new territories. **John R. H. Truelsen,** formerly responsible for southern Wisconsin, has assumed responsibility of northern Illinois. He will continue to operate under the direction of Raymond E. Taylor, Chicago district manager. **F. Donald Wing,** field engineer in Chicago, has been appointed abrasive engineer and is to assume the responsibility of southern Wisconsin to succeed Mr. Truelsen. He will also work under the direction of Raymond E. Taylor.

— o —

The appointment of **J. S. Roscoe** as director of purchasing has been announced by The Lincoln Electric Co., Cleveland, Ohio. Mr. Roscoe has been with Lincoln since 1924, serving as welding engineer and district manager responsible for welding development in Syracuse, Pittsburgh, and Chicago.

Less Labor–
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QUADRILL & QUAD-TAPPER
Increase Production 33%
Fits Directly on Drill Press
• Uses up to 4 drills and tapper on single press
• Saves moving of jig from one press to another
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• A thoroughly PROVEN tool. Thousands in use.
Investigate this important work-saver. Write for literature today.
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Did You Know?---

Everett M. Hicks, manager of the Grinding Machine Division of Norton Co., Worchester, Mass., has been appointed a member of the Industry Advisory Committee of the Office of Price Stabilization. This committee, composed of 16 members, will advise the O.P.S. on price regulations affecting the machine tool industry.

—o—

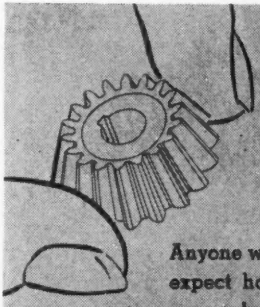
Mechanical Air Controls, Incorporated, manufacturer of "Mac" air valves, has announced occupancy of a new building at 15311 W. 11 Mile Rd., Royal Oak, Michigan.

—o—

Joseph G. Surmacz has been named to the newly created position of chief industrial engineer of Harnischfeger Corp., Milwaukee, Wis., in which position he will be in charge of production control.

—o—

Donald C. Kopp, service engineer of The Monarch Machine Tool Co., Sidney, Ohio, who since 1947 has traveled throughout the United States and Canada installing Monarch lathes and instructing operators in their use, will spend the next 12 months in Europe on a special assignment for the company. He will make his headquarters in London, England, replacing **Paul Hawkins,** who returns to new responsibilities in Monarch's home office sales force after a year abroad contacting dealers and users of the company's turning equipment.



Planting Seed

Anyone who plants seed haphazardly can expect haphazard results. Planting seed *properly* takes a lot of care.

It's the same way with our business. We get a lot of small orders, and welcome them. But, like most businessmen, we want our small accounts to grow into larger ones. We've found that the only way to get *big* orders, is to get *small* orders and do them well. That's been a continuing policy with us. We've made gears from thousands of patterns, and we have the engineering staff to provide any special gear in any size, for any purpose. We like to feel that our garden of customers grew from well-cultivated seed. THE EARLE GEAR & MACHINE CO., 4707 Stenton Ave., Philadelphia 44, Pa.

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EARLE GEARS

Did You Know?---

Seventy-three employees of the Manhattan Rubber Division, **Raybestos-Manhattan, Inc.,** Passaic, N. J., who completed 25 years with the company during the past year were honored recently at the Seventh Annual Dinner of the Manhattan Pioneers. This event was attended by over 600 of the veterans and their wives.

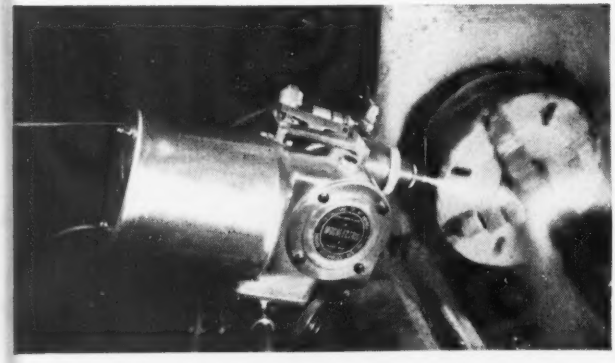
O. Wendell Macy, formerly sales manager at the Logansport Machine Co., Inc., Logansport, Ind., has been appointed sales manager of the Hydraulic Power Division, The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

—o—

Philip R. Marsilius, vice president and secretary of The Producto Machine Co., Bridgeport, Conn., and president of The Producto Corporation of Detroit, has been named chief of the Tool, Die, and Fixture Section, Machinery Division, NPA. Mr. Marsilius is a trustee of the National Tool and Die Manufacturers Association and president of the Southern Connecticut Tool and Die Manufacturers Association.

—o—

Major General Russell L. Maxwell, vice president in charge of personnel for American Machine & Foundry Co., New York, N. Y., has been elected to the company's board of directors. General Maxwell came to AMF in August 1946 upon his retirement from the U. S. Army.



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If you already have metallizing equipment, why not consider a trade-in now for the new Mogulectric Gun.

Write for new booklet containing complete information on equipment as well as production and maintenance applications.

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Did You Know?---

Peaslee-Wells, Inc., 1285 Riverdale St., West Springfield, Mass., has been appointed an authorized distributor for western Massachusetts, eastern Vermont, and western New Hampshire by Carboloy Company, Inc., Detroit. Carboloy standard tools, standard blanks, carbide-tipped masonry drills, and diamond impregnated carbide wheel dressers will be carried in stock for prompt delivery to users in the company's territory.

—o—

W. F. Rockwell, Jr., president of Rockwell Mfg. Co., Pittsburgh, Pa., has announced the acquisition of the **Ohlen - Bishop Mfg. Co.,** Columbus, Ohio, manufacturer of a complete line of mill and factory woodworking saws and saw blades consisting of circular, band, gang and crosscut types. The company also makes a trade line for carpenters, plumbers, electricians, and butchers, plus a complete line for the home workshop.

Elmer E. Legge, general manager of the Henry & Wright division of Emhart Mfg. Co., is now general manager of the firm's V & O Press Company division in Hudson, New York. Appointed as acting factory manager of V & O is Gilbert T. Coovert, with the press company as personnel director since last October. Mr. Legge succeeds Herman F. Zorn, who has resigned.

SAMSON PLATE, ANGLE and BAR SHEAR

(Bench Type)

- **All Steel Construction**
- **Easy Operation**
- **Unbreakable Frame**

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No. 5RP7

$207.00

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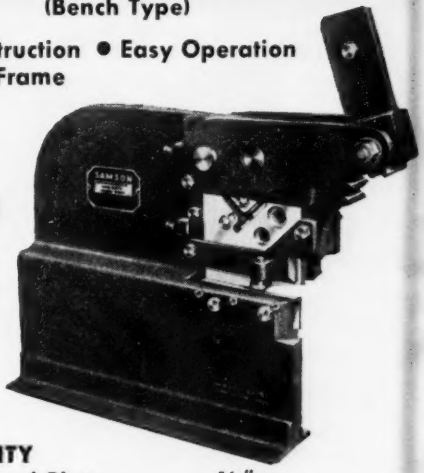

CAPACITY	
Sheets and Plate	1/4"
Flats	3/8" x 3"
Rounds	5/8"
Squares	1/2"
Angles and Tees	2" x 2" x 3/16"

Catalogue of Metal Working Equipment furnished on request.

JULIUS BLUM & CO., Inc.
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Did You Know?---

Lindberg Engineering Company, Chicago, manufacturer of heat treating furnaces and melting furnaces, has announced the opening of a direct factory sales office in Atlanta, Georgia. **Philip J. Duffy** has been moved from the Chicago office to take charge of this office, which will cover the states of Georgia, Alabama, Mississippi, and Florida.

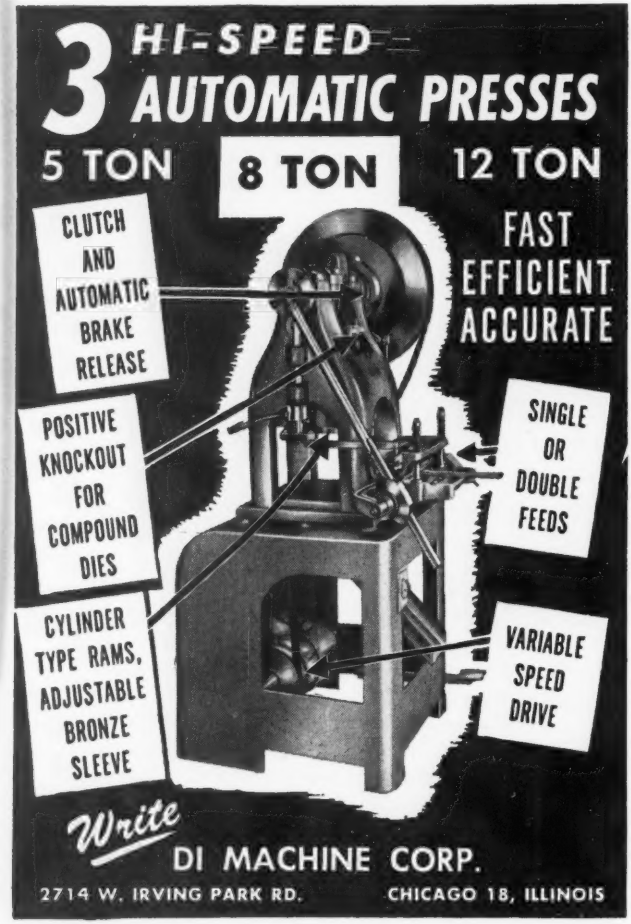
Fred H. Haggerson, president of Union Carbide and Carbon Corporation, has also been elected chairman of the board of directors. Mr. Haggerson has been president of Union Carbide since 1944 and has been associated with the corporation for over 30 years.

— o —

Niagara Machine & Tool Works, Buffalo, N. Y., manufacturer of presses, shears, machines and tools for plate sheet metal work, has announced the appointment of the **Austin-Hastings Co.,** Cambridge, Mass., as sales representative for its entire line in all of New England except Connecticut.

— o —

R. Ruzicka, associated with The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, for the past 10 years, has been appointed manager of installation and service, in which capacity he will coordinate various LeBlond projects in relation to the defense effort and supervise the installation of this type of equipment. Mr. Ruzicka will also continue to perform his duties as assistant sales manager.



Did You Know?---

Fred K. Powell, Jr., formerly director of engineering, has been named vice president in charge of engineering for American Machine & Foundry Co., New York, N. Y. **Harry P. Sparkes,** director of the contract division and sales assistant to the president, has been made divisional vice president of the contract division. **Tyler Weymouth,** general manager of the company's tobacco machinery and international division, has been appointed divisional vice president of this division. **E. J. Zimmer, Jr.,** manager of AMF's contract division, has been appointed assistant divisional vice president of the division.

—o—

The Cro-Plate Co., Inc., Hartford, Conn., industrial hard chrome plater and manufacturer of metal finishing and plating equipment, has announced the appointment of **Richard J. Dunne** as eastern division sales engineer, in which capacity he will serve the chrome-plating needs of metal working-plants and printing houses in the New York and New Jersey area. The company has also announced the appointment of **Clarke W. Clemmer, Jr.,** as eastern division equipment engineer. In this position, Mr. Clemmer will be concerned with engineering and sales of the company's wet-blasting and chrome-plating units in the Connecticut and Massachusetts area.

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for putting the dial indicator right where you want it — in a jiffy — and keeping it there! Alnico permanent magnet has powerful grip — guaranteed against loss — on all four sides.

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Company .....
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Did You Know?---

The appointment of **C. W. Powell** as Pittsburgh branch manager for Carboloy Company, Inc., Detroit, has been announced by J. M. Bertotti, Carboloy field sales manager. Mr. Powell, who will make his headquarters at 704 Second Ave., Pittsburgh 19, Pa., joined the Carboloy Company in 1943, serving as sales and service manager in both the Midwestern and East Central districts.

— o —

L. A. Dixon, vice president of Rockwell Mfg. Co., Pittsburgh, Pa., has announced the appointment of **Norman W. Rowand** as general manager of the Pittsburgh plant of the company's Meter and Valve Division. Mr. Rowand was formerly chief industrial engineer for the Pittsburgh-DuBois Division, DuBois, Pa., and plant manager of the Regulator Division, Norwalk, Ohio.

The election of **John R. Wanamaker,** great grandson of the late John Wanamaker, to the board of directors of Henry Disston & Sons, Inc., Philadelphia, Pa., has been announced by Jacob S. Disston, Jr., president of the 111-year old saw, tool, and steel manufacturing firm.

— o —

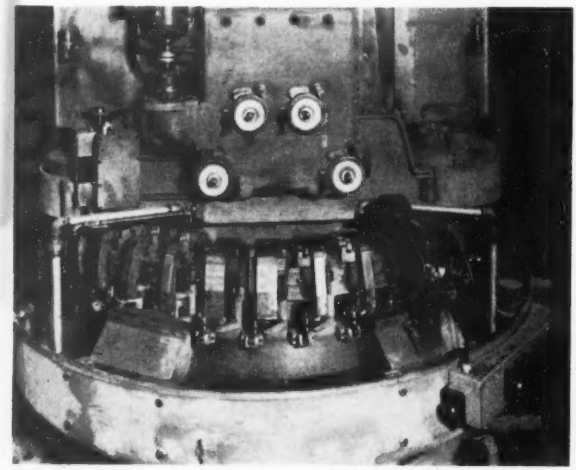
The board of directors of Automatic Steel Products, Inc., Canton, Ohio, has elected **Douglas H. Miller** as treasurer of the corporation. Mr. Miller was formerly with Alexander Grant & Company, certified public accountant and auditor for Automatic and its affiliates.

— o —

Ralph Hubbart, president of Allied Products Corp., Detroit, Mich., has announced that, at the annual meeting of the board of directors, **Frank H. Bishop** was elected executive vice president. Mr. Bishop was previously a vice president of the corporation.

Automatic Finish Grinding Setup

This close-up view of a specially equipped four-spindle rotary surface grinder completed by Mattison Machine Works, Rockford, Ill., for finish grinding the bodies and covers of automotive oil pumps shows the automatic clamping fixtures in which the workpieces are held. A safety device is provided which stops the table in the event the operator does not locate the work properly in the fixtures. Automatic sizers are constantly in operation checking the work and keeping all of the pieces within specified tolerances without the operator's attention.



Did You Know?---

A. L. Bergstrom, vice president of The Timken Roller Bearing Co., Canton, Ohio, has announced the appointment of **C. M. Maratta** as chief consulting engineer, **L. A. Holder** as chief mechanical engineer, **H. J. Urbach** as executive engineer, and **R. A. Schimpf** as chief works engineer of the company.

—o—

J. J. Demuth, president of the American Society of Tool Engineers and general superintendent of Sligo, Inc., St. Louis, has been awarded an honorary membership in the Institute of Production Engineers, the British equivalent of the A.S.T.E.

—o—

Kennametal Inc., Latrobe, Pa., has announced the appointment of **William M. Stoll** as mining engineer, with the duties of locating and procuring minerals that constitute basic materials essential for the production of cemented carbides used in tools for metal-working and mining.

Skilsaw, Inc., Chicago, Ill., manufacturer of portable power tools, has purchased the controlling interest in Loud-Wendel, Inc., Middleport, N. Y., producer of circular wood saws, dado sets, and industrial knives. In acquiring control of Loud-Wendel, Bolton Sullivan, president of Skilsaw, stated that his company is now assured of a constant source of high quality saw blades.

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Book Reviews

Company Procedural Manual on Equipment Analysis. Prepared by Machinery & Allied Products Institute and published by William Kelly & Co., 120 S. La Salle St., Chicago 3, Ill. 45 pages, 8½ x 11 inches. Cloth binding, board covers. Price (single copy), $5.00; discounts on 10 or more copies.

A manual of detailed policy and procedure, with analysis forms and work instructions, this volume is intended to help the reader increase production, protect the nation's security, and improve his plant and equipment by providing a self-contained system for determining the economic advantage of new equipment, reequipment or replacement, and plant expansion. The forward of the book presents the background of Machinery and Allied Products Institute research as published in "Dynamic Equipment Policy" and the "M.A.P.I. Replacement Manual" (two other publications of the institute).

Following the forward, the contents of the manual are arranged as follows: Experience in Application to Shop Operations of Clientele; Company Equipment Policy; Cornerstones of Scientific Approach to Equipment Analysis; Method and Formula; Basic Analysis Forms; Working Instructions for Operational Comparisons; Selection of Equipment to be Tested for Replacement; Selection of Equipment to be Tested for Acquisition; Determination of Service Life; and Processing, Periodic Reports, and Capital Budgets. Sets of three volumes—the "Company Procedural Manual" together with the "M.A.P.I. Replacement Manual" and the "M.A.P.I. Dynamic Equipment Policy"—are also available at a price of $11.50 per set.

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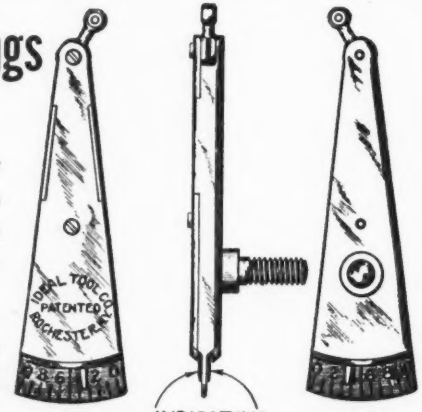

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IDEAL TOOL CO., 407 RIVER ST., ROCHESTER 12, N. Y.

Carbide Cutting Tools. By Warren Baker and Joseph S. Kozacka. Published by American Technical Society, Chicago, Ill. Distributed by Educational Training Dept., Vascoloy-Ramet Corp., 800 Market St., Waukegan, Ill. 416 pages. 283 illustrations. Washable cloth binding. Price, $5.50.

Written for easy understanding by the novice and technician alike, this book contains complete information regarding carbides and cutting problems gathered from every available source. It covers the development of tools since the beginning of their history to the eventual conversion to the carbides. Every phase of carbide use is discussed in the 17 chapters dealing with converting, tool angles, tipping, grinding, power, speeds, design, coolants, milling cutters, selection, assembly, and general applications.

The book was written by two authorities on carbides; namely, Warren Baker, M.S., and Joseph S. Kozacka, B.M.E., M.S. Mr. Baker, retired editor of "Science and Mechanics," is managing partner of the Model Engineering Co., Chicago, and a member of the American Society for Metals. Professor Kozacka is associate professor of mechanical engineering at the University of Illinois, engineering consultant for Vascoloy-Ramet Corporation, and supervisor for the Illinois Institute of Technology. Along with the book, Vascoloy-Ramet is furnishing a study guide prepared and sponsored by the American Technical So-

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ciety. This guide can be used at home by the individual and in the shop for employee training programs.

New Lessons in Arc Welding. Published by The Lincoln Electric Co., Cleveland 1, Ohio. 320 pages, 6 x 9 inches. Illustrated. Simulated gold-embossed leather binding. Price, $1.00 in U.S.A.; $1.50 elsewhere.

This book is based on lessons and instruction given at the Lincoln Arc Welding School. The lessons are practical, not theoretical, and fully cover basic fundamentals of arc welding, as well as advanced welding in alloys, sheet metal, and pipe. The basic 32 lessons cover welding mild steel in all positions, and 29 advanced lessons cover other welding applications. Practice materials, exercises, questions, and answers are given for each lesson.

Practical information contained in a 163-page welding application section is intended to help welding operators advance in knowledge and skill after fundamentals have been mastered. Explained are: (a) latest welding procedures for fast and economical welding; (b) automatic and semi-automatic hidden arc welding procedures; (c) how metals are made and how to identify them; (d) how to select correct welding joints; and (e) how to make common machine parts to use welding instead of casting. The book is printed on high quality paper and is fully illustrated with pictures and drawings.

How to Run a Drill Press. Published by South Bend Lathe Works, South Bend 22, Ind. 32 pages, 5⅛ x 8 inches. More than 75 illustrations. Price, 25 cents postpaid.

Devoted exclusively to the small sensitive-type drill press, this book contains a wealth of practical information of value to the experienced machinist as well as the beginner. A section covering care, operation, and maintenance of a drill press includes illustrations showing the names and functions of all important parts and correct adjustment of each unit. Detailed instructions and clear illustrations are provided for grinding a drill point so that it will cut properly. In addition, recommended methods for mounting and removing chucks and tools are explained, and many paragraphs are devoted to a discussion of the best practices for laying out and setting up work.

Although intended primarily for metalworking shops, the book includes data on many special classes of work, including boring and sanding wood parts, drilling through glass, polishing and buffing, surface finishing, and the use of a mortising attachment, vise, and other equipment.

Vanadium Data Sheets. Published by Vanadium Corporation of America, Graybar Bldg., 420 Lexington Ave., New York 17, N. Y. 80 pages. Spiral binding. Available without charge to

qualified persons whose requests are received on company letterhead.

This book contains information, in tabulated form, on 180 different compositions of vanadium irons and steels, including constructional steels, spring steels, plate and sheet steels, tool steels, cast steels, and alloyed irons. Chemical compositions, heat treatments, mechanical properties, and typical uses are shown. In addition, the book includes an unusually detailed index of applications and recommended compositions for each, covering a variety of industrial fields such as automotive, aircraft, railroad, diesel, and so on.

These data have been assembled to provide metallurgists and design engineers with concise, detailed, and readily accessible information on vanadium steels and irons as an aid to successful design and to the selection of materials suitable for specific applications and methods of fabrication. The information, it is believed, will be of considerable value also to those interested in the production, fabrication, and use of ferrous metals.

Proceedings of the 14th Annual Time and Motion Study and Management Clinic. Published by Industrial Management Society, 35 E. Wacker Dr., Chicago 1, Ill. 112 pages. Illustrated. Price, $3.00

This volume comprises the proceedings of the 14th Annual Time and Motion Study and Management Clinic sponsored by the Industrial Management Society, November 1-3, 1950 at the Sheraton Hotel, Chicago. Included are charts, forms, and illustrations, as well as complete transcripts of talks

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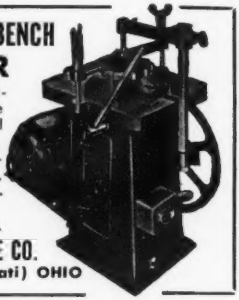
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by top leaders of labor, management, and government on various topics, such as time study, motion economy, methods, plant layout, materials handling, wage incentive, maintenance, and human relations.

Punching, Shearing and Bending. By William C. Tucker. Published by Buffalo Forge Co., 3ℰ8 Broadway, Buffalo, N. Y. 80 pages, 4¾ x 7½ inches. Wire binding. Price, $3.00 postpaid.

This pocket-size handbook is intended for the men who operate metalworking machines, for the men whose responsibility it is to keep them working properly, and for the men who design work for these machines. In simple language, the fundamentals of punching, shearing, and bending structural shapes are described, including construction and operation of the various types of machines generally used in modern fabrication operations; comparative punching capacities; cold shearing limitations; average ultimate strength of materials; good procedure to practice and care to be exercised in avoiding damage to tools and injury to operators. The author of the book is chief engineer of the Tool Division of the Buffalo Forge Company.

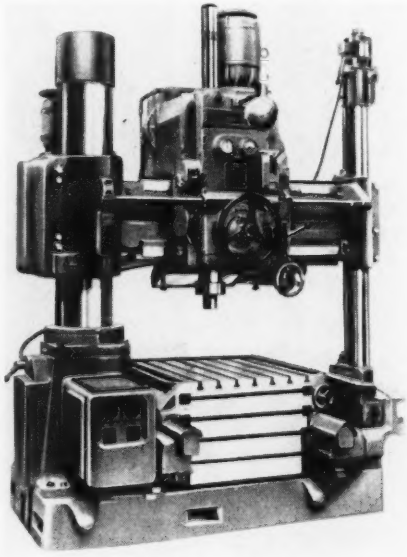
New Shop Equipment

Production Jig Borer Provides 18 Spindle Speeds and 12 Feeds

Cosa Corp., 405 Lexington Ave., New York 17, N. Y., has introduced the Oerlikon Production Jig Borer for precision and production boring, drilling, reaming, tapping, screw cutting, facing, and outside turning without jigs. This double-column machine is designed so that the boring head, cross rail, and smaller column can be locked rigidly in any position. The rigid frame thus created is said to make it possible to locate holes (by the coordinate method, using gage blocks or pins) to a tolerance of 0.0004 to 0.0008 inch between centers and to drill holes as small as 0.040 inch in diameter.

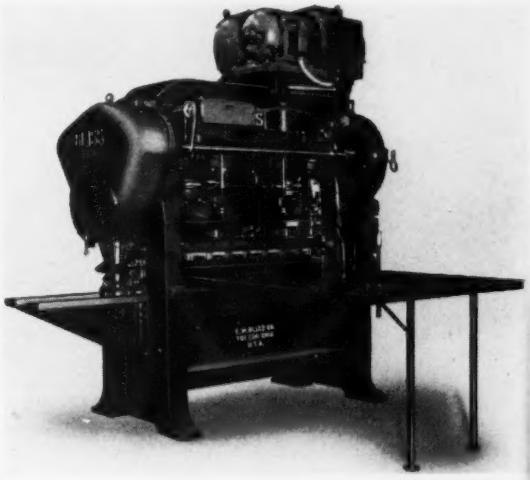
The machine is available in two models, each having 18 spindle speeds and 12 feeds. The Model R-2 has speeds from 38 to 1,900 r.p.m. and feeds from 0.0012 to 0.031 inch per revolution; the Model R-3 has speeds from 30 to 1,500 r.p.m. and feeds from 0.0012 to 0.0472 inch per revolution. The motor on the boring head of the Model R-2 is 6 h.p.; the Model R-3, 7.5 horsepower.

The smaller column at the extreme end of the cross rail rides easily over a wide arc. This column, head, and arm are locked rigidly by electro magnets controlled by a single switch. They can also



Oerlikon Production Jig Borer

Bliss No. 8150 Perforating Press



be mechanically locked or released independently of each other. Additional design features include a fast mechanical return of spindle, in addition to hand operation; automatic feed for setting depth of holes up to 14½ inches; tool-ejector bar inside the boring spindle; and graduated precision scales with vernier readings to 0.0008 inch on ways of boring slide and work table. All operating controls are conveniently located on the boring head.

High Speed Press Punches Slots, Rounds or Ovals

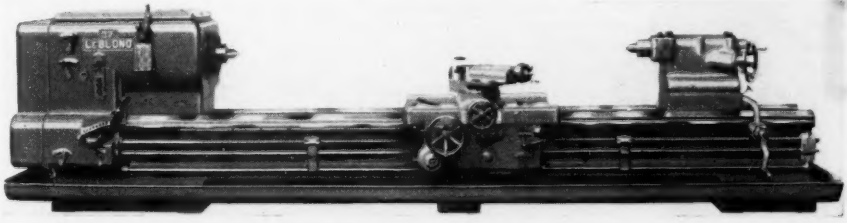
Identified as the No. 8150, 150-ton high-speed perforating press which is designed to punch slots, rounds or ovals, either in straight rows or with alternating rows staggered, has been developed by E. W. Bliss Co., Canton, Ohio. Built to operate in a speed range from 100 to 200 s.p.m. with a variable speed drive, the press can handle a maximum sheet width of 54 inches.

The stagger motion is accomplished by feeding the sheet straight through the press and by moving the punch and die from side to side. The amount of stagger is adjustable. A counter attachment can be set to stop the press automatically after a predetermined number of rows have been punched. An automatic safety device stops the feed before the tail of the sheet reaches the punching line, leaving any desired margin between the last row of holes and the edge of the sheet.

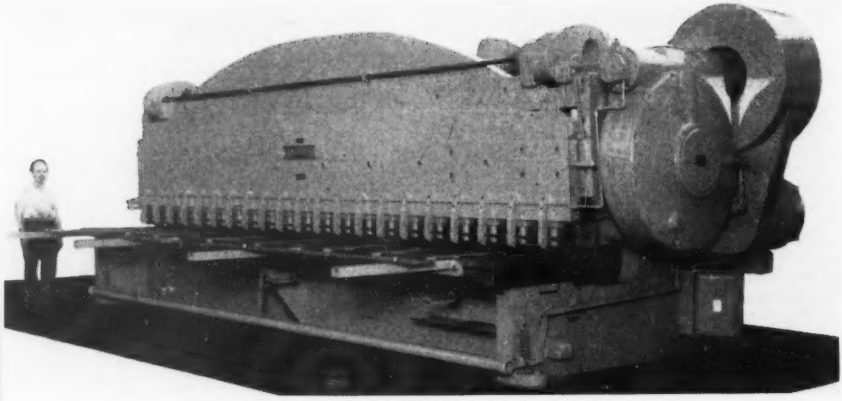
The precision feeding mechanism consists of entry and exit feed rolls of hardened alloy steel, driven by a feed crank adjustable for different feed increments. The stroke of the slide can be adjusted for different stock thicknesses. A releasing mechanism, provided for the upper gripping rolls, releases both rolls simultaneously. For easy installation of die sets from the front or back of the press, the feed rolls can be slid onto a support bracket extending to the side of the press. A die can also be inserted through the uprights.

Heavy Duty Engine Lathe Includes Four Directional Power Rapid Traverse

Four-directional power rapid traverse, standard equipment on the LeBlond 32-Inch Heavy Duty Engine Lathe announced by The R. K. LeBlond Machine



LeBlond 32-Inch Heavy Duty Engine Lathe



Cincinnati ½-Inch All-Steel Squaring Shear

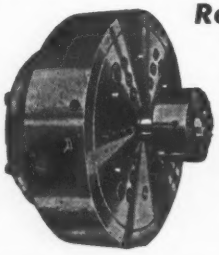
Tool Co., Cincinnati 8, Ohio, makes possible fast and convenient traversing of carriage and cross-slide, each in two directions. The lathe may be equipped for hydraulic (Hydra-Trace) or mechanical profiling. Other features include 34½-inch swing; 32 spindle speeds from 4 to 500 r.p.m.; totally-enclosed quick-change box; hardened and ground replaceable steel bed ways; and automatic lubrication through headstock, quick-change box, and apron.

The headstock incorporates the free-running principle with hardened and ground steel gears; only the gears actually needed are in mesh at a given speed, the remainder running free. No-load friction horsepower is thus minimized, leaving maximum power available for removing metal. The machine is arranged for a 25, 30, or 40 h.p., 1,200 r.p.m. motor. Forty-eight feeds and threads may be selected. Feeds range from 0.004 to 0.250 inch; threads from ¾ to 46.

Shear Has Capacity for 20 Feet of ½-Inch Mild Steel Plate

Manufactured by The Cincinnati Shaper Co., Cincinnati 25, Ohio, the all-steel squaring shear illustrated herewith has a capacity for 20 feet of ½ inch mild steel plate, weighs over 135,000 lb., and provides a speed of 20 strokes per minute. It is equipped with hydraulic hold-downs capable of exerting a holding force of over 70 tons. The hold-down pistons are made with automobile type piston rings for long life and have a unique vacuum pump arrangement that is said to prevent leakage of hydraulic oil.

The shear has a 24-inch throat or gap and a 48-inch back gage range. Standard equipment includes four edge high carbon tool steel knives with straight sides and a section measuring 1¾ x 6½ inches; ball bearing back gage with graduated dials; automatic lubrication; hinged angle; and complete guarding.



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By scientific distribution of metal (rather than sheer mass) these new machine tools have rigidity and stamina not always obtained in more cumbersome machine tools. Lighter, handier and easier to run, they can be safely operated by the less experienced—by whatever operators available.

Produced in numbers, in a specially built and tooled plant, Sheldon Precision Machine Tools are low in price. Today for the cost of a single older type tool you can have 2, 3 or even 4 SHELDON units . . . can put 2, 3 or 4 operators to work . . . can double or triple your productive capacity for the same machine tool investment. *Let us show you how.*

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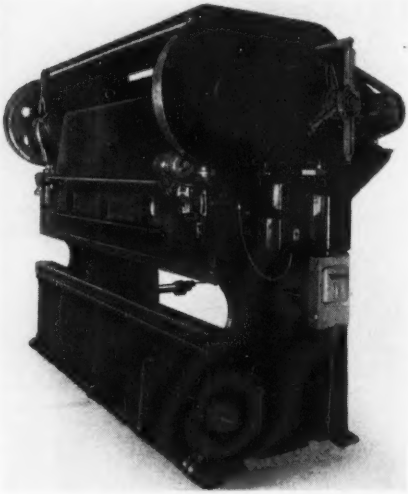
Press Brake Includes Extra Large Clutch and Brake for Instantaneous Stopping of Ram

One of a line of press brakes introduced by Struthers Wells Corp., Titusville, Pa., the 8-foot 100-ton machine illustrated herewith is equipped with an extra large clutch and brake for instantaneous stopping of the ram at any desired position. The ram can be accurately positioned by push-button control, with each connecting screw pro-



Struthers Wells Press Brake

vided with a micrometer adjustment and scale indicator.

Accurate forming and coining operations, with deflection held to a minimum, are afforded by a construction which includes an extra heavy steel press frame; eccentrics supported on two large bearings, each of which is backed up against the frame; and a power push line held along a straight line almost entirely within the press frame. The design of the unit also includes alloy steel high speed gears which are heat treated and machined with a special tooth form. Shafts are mounted in anti-friction bearings and operate in an oil bath and enclosed housing. The clutch is a single plate low pressure type which can be easily adjusted from the outside. The ball type brake is self-energizing, and either the clutch or brake may be removed without dismantling other parts.

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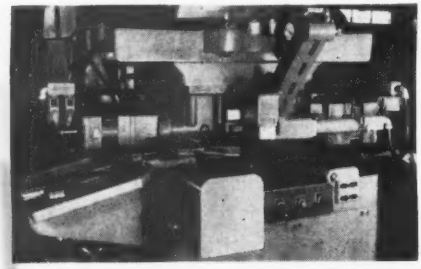

Illustration showing typical application of Michigan Automatic Unloading Atachment. Guards have been removed from the machine for clarity.

shaving machines has been introduced by Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Said to be especially adaptable to the unloading of small gears when automatic loading is employed, the attachment consists of a small wire-mesh belt which travels over two drums. The drive is from a low horsepower electric motor; slots in one mounting bracket allow adjustment to take up slack in the belt.

The unloader can be quickly attached to any Michigan 870 or 870A automatic gear finisher in any of several positions with no changes in the machine except the drilling and tapping of a few holes for mounting brackets and the discharge chute.

Compound for Tapping Armor Plate

Designated as No. 44C Lubricant, a soft paste for use in the tapping of armor plate and other hardened steel has been developed by Wayne Chemical Products Co., Copeland & Main Sts., Detroit 17, Mich. The compound is said to contain no water or mineral oil—only fatty oils and pigments, including graphite and sulphur. It may be used for tapping, boring, threading, and other operations.

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2A

Boring and Facing Tool Includes Power Feed Feature

A newly designed Chandler-Duplex Boring and Facing Tool introduced by Chandler Tool Co., Muncie, Ind., is available in six models to fit a wide variety of machines for use in performing boring, facing, turning, grooving, and undercutting operations. Accurate setting of the tool is said to be assured by extremely fine slide adjustments in increments of one-tenth of one-thousandth inch which are made by means of a calibrated feed ring. The power feed feature is said to provide for uninterrupted travel of the slide for taking facing cuts or cutting grooves. The slide travel is easily controlled by holding the feed ring stationary while the tool head is in operation and the clutch pin is engaged.

Chandler-Duplex Boring and Facing Tool

Other features of the tool include rapid traverse of the slide for position in either direction; extra fine pitch feed screw to permit heavy facing and grooving cuts, precise slide adjustments, and the production of smooth finishes on facing cuts; strong worm gear drive which is said to enable heavy cuts to be taken without danger of tool breakage; unusually long slide travel; interchangeability of shanks; hardened and ground parts; positive slide stop which may be set for cuts of predetermined depth; simplified lubricating arrangement; and adjustment of slide by large dial at the rear of the body or calibrated feed ring at the top of the head.

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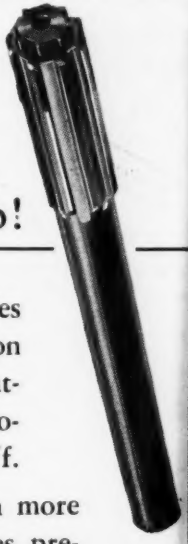


The superior quality of Staples Carbide-Tipped Expansion Reamers and other circular cutting tools shows up on the production line, where it pays off.

Staples quality pays off in more holes per hour, close tolerances, precision results, longer tool life. Put Staples Tools to the test in your own production and compare.

Tell us your requirements, and our engineers will gladly make recommendations.

THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio

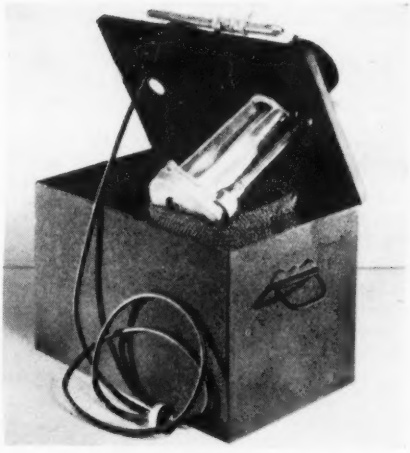
Distributors in Major Cities

Staples CARBIDE-TIPPED CUTTING TOOLS

A complete line of Circular Carbide-Tipped Cutting Tools
Expansion Reamers — Special Tools

Portable Coolant System Holds 7 Gallons of Fluid

Designated as the Strainco Model No. 1-2-7, a portable coolant system measuring 16 x 10 x 10 inches and holding 7 gallons of coolant or cutting oil—a capacity that is said to be adequate for lathes, drill presses, and the other usual metal-working machines—is now being marketed by Strainer Products Corp., Dept. MMS, 489 Black Oak Ridge Rd., Paterson, R. D. No. 4, N. J. Made of 16 gauge cold rolled steel with baked enamel finish, the unit includes a special alloy aluminum pump which can be easily moved for inspection; Redmond continuous duty motor; and all-steel wire mesh chip strainer. It is furnished wired, ready to use.



Strainco Model No. 1-2-7 Portable Coolant System

PLYMETAL BRAZING SHIMS for *CARBIDE TOOL TIPS*

In
- **SILVALOY #2501 and**
- **SILVALOY #5031**

Silvaloy No. 2501 and No. 5031 are clad materials furnished in three thicknesses:
.020 thick consists of .010 copper center—clad both sides with .005 Silvaloy No. 2501
.011 thick consists of .005 copper center—clad both sides with .003 Silvaloy No. 503
.016 thick consists of .008 copper center—clad both sides with .004 Silvaloy No. 503

Each of the alloys are furnished with or without radius, square or rectangular, Pentagon shape 80 degree with radius, Pentagon shape 60 degree no radius, triangle, circles, etc. Available in all standard tool sizes.

Shims are also available in Silvaloy No. 503, No. 2501, Contantine and Copper.

STEEL SALES CORPORATION
3348 So. Pulaski Rd., Chicago 23, Illinois
BIshop 7-7700

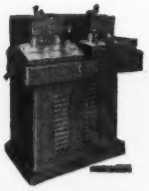
Production Miller for Small Parts

The Viking No. 618 Hydraulic Speed-Mill illustrated herewith, product of Viking Industries, Dept. H, 220 Montague St., Rockford, Ill., is described as a light production milling machine for the fast milling of small parts requiring close limits and fine finish. Designed to accommodate rotary cutters up to 6 inches in diameter, the machine features an automatic milling cycle, hydraulic feeds, and maximum rigidity, and is constructed to occupy a minimum of floor space.

The machine is arranged to cycle

Get the facts TODAY!

ON THE WORLD'S MOST *MODERN* GRINDER FOR CARBIDE, STELLITE and HIGH SPEED STEEL TOOLS



- **SAVES TIME**
- **SAVES MONEY**
- **SAVES SPACE**
- **PERFORMS WITH EFFICIENCY**

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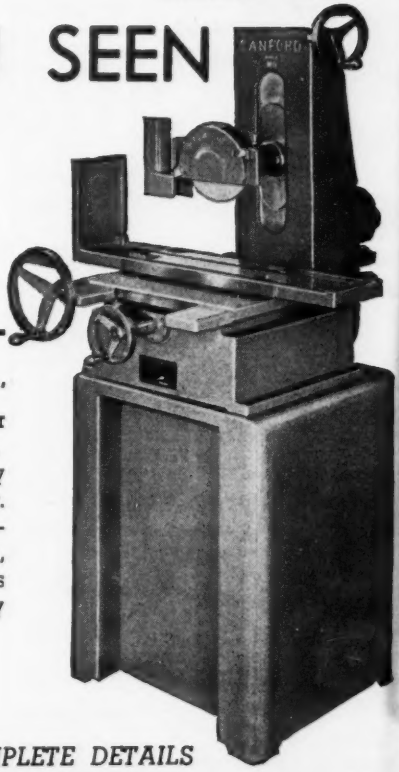
THE STANDARD ELECTRICAL TOOL CO.
2487 RIVER ROAD **CINCINNATI 4, OHIO**

SANFORD

SURFACE GRINDER

HAVE YOU SEEN

Model MG



A GRINDER LIKE THIS BEFORE

-:- COMPARE -:-

Capacity: 8¾" transverse, 13" longitudinal, 12" vertical under 7" dia. Wheel with Adapter. Meehanite Castings and the very sturdy construction (weight appr. 630 lbs.) assure long life, accuracy, vibrationless operation, form grinding by crush methods and finishes to microinches, dry or wet.

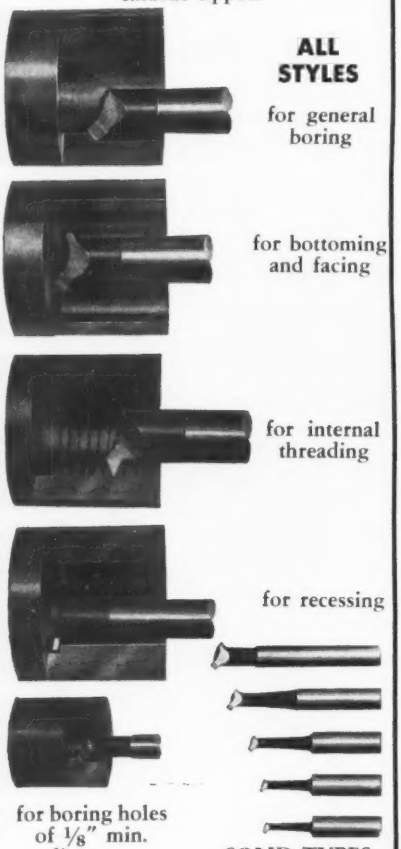
WRITE FOR COMPLETE DETAILS

BORING TOOLS

WITH *EXTRA* ADVANTAGES!

- **REPLACEABLE TIPS AND SOLID TYPES**
- **IN FOUR FORMS**
- **FULL RANGE OF SIZES**

To re-sharpen — grind top face only. Made of Super-High-Speed steel or carbide tipped.



ALL STYLES for general boring

for bottoming and facing

for internal threading

for recessing

for boring holes of 1/8" min. diameter.

SOLID TYPES

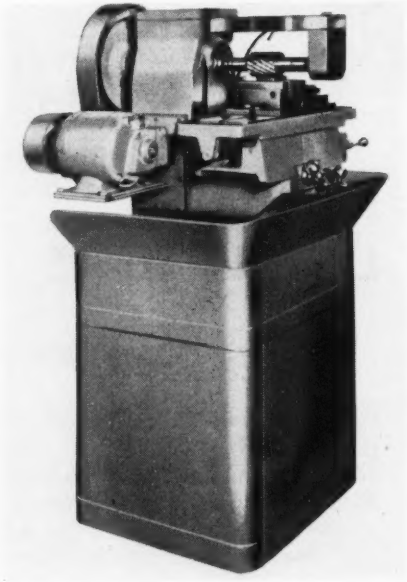
Write for catalog

R. B. TOOL CO., Inc.

41 East Hartsdale Ave.
Hartsdale, New York

within a period of 10 seconds to 18 minutes, including full table travel. Cycle time varies according to the size of cut and length of travel. Hydraulic feed through valve selection is infinite from 3/8 to 24 inches per minute over a 7-inch maximum length of cut. A separate 3/4 h.p. motor is used to drive the spindle, and standard type 1/2 h.p. motor drives the hydraulic motor and coolant pump off the same shaft.

The cutter spindle is rigidly supported



Viking No. 618 Hydraulic Speed-Mill

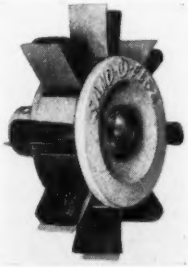
at the outboard end through a heavy rectangular steel bar overarm and bronze bushing, and is mounted in double high precision grease-sealed Timken bearings. The spindle size is 2 inches with a No. 9 Brown & Sharpe taper for mounting arbors, shanks, and adapters. Four spindle speeds of 200, 375, 625, and 975 r.p.m. provide flexibility for a variety of cuts.

Ample working space is provided by a 6 x 18-inch table. Machine table travel under power is 8 1/2 inches. Work is raised and lowered through convenient crank dials. Fully equipped with safety and splash guards and designed to operate on 220-volt 60-cycle current, the machine

weighs approximately 1,050 lb. and occupies an area of 30 inches deep x 32 inches wide x 51½ inches high.

Sanding Wheel Finishes Curved and Contoured Surfaces

An improved sanding wheel, to be known as the "Sand-O-Flex" Model 350R, is now being produced by Merit Products, Inc., 4023 Irving Pl., Culver City, Calif. A brush-backed sanding device that may be attached to any rotating shaft for sanding and finishing curved and contoured surfaces, the wheel is particularly recommended for use with portable electric drills and flexible shafts because of its light weight and compactness.

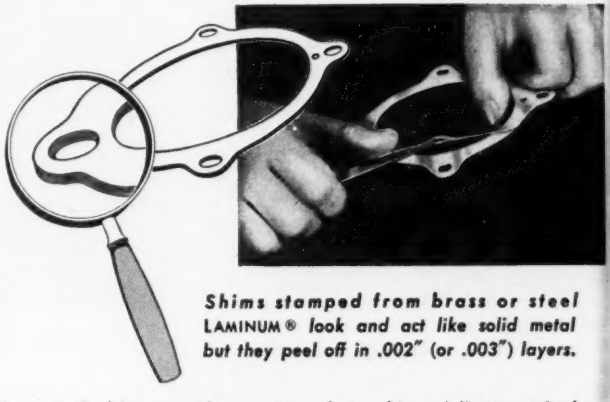


"Sand-O-Flex" Model 350R Sanding Wheel

The cover has been concaved to allow the knurled nut, which holds the cover in place, to be inset flush with the face of the tool, thus materially reducing the bulk and increasing the wheel's efficiency and maneuverability when being used portably. The overall diameter of the wheel is 5½ inches. The sander has eight replaceable brushes fastened to its perimeter. These brushes back up and "cushion" eight strands of abrasive cloth, 1 inch wide, which unwind from a single core. As the wheel rotates, the abrasive strips mold to the contour of the workpiece with a "paint-brush" action and finish metals, compositions, and any other material requiring an abrasive operation. When the wheel rotates at normal speed, it delivers 14,000 sanding strokes per minute. As the abrasive wears, it is cut or torn off and new abrasive is fed out from the central magazine. By changing grit, all types of finishes can be obtained—from coarse to very fine satin finishes.

LAMINATED SHIMS

SIMPLY PEEL FOR ADJUSTMENT



Shims stamped from brass or steel LAMINUM® *look and act like solid metal but they peel off in .002" (or .003") layers.*

Laminated shims provide great accuracy with easy, economical machining tolerances. This simple method of spacing adjustment reduces lathe time, eliminates standby machines. Adjustments in thousandths are made right at the job with a penknife. You eliminate the counting, stacking and miking of ordinary shim procedure.

SEND TODAY for our Engineering Data File

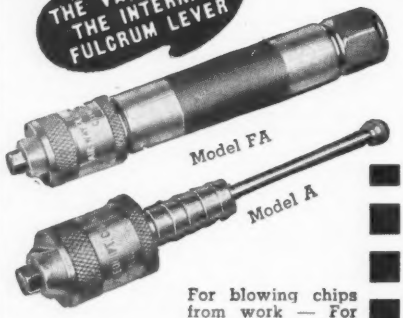
LAMINUM

THE SOLID SHIM THAT peels FOR ADJUSTMENT

LAMINATED SHIM COMPANY, Inc.

3307 UNION STREET GLENBROOK, CONN.

Air-O-Chek
THE VALVE WITH THE INTERNAL FULCRUM LEVER

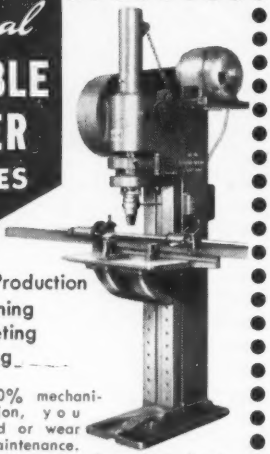


For blowing chips from work — For cleaning out hollow sets, machine recesses and tee slots— For drying parts before inspection and for many similar uses, Air-O-chek is *the* Air-gun.

Write for details.

AIR-WAY PUMP & EQUIPMENT CO.
1046 N. Kilbourn Ave. Chicago 51, Ill.

General
FLEXIBLE POWER PRESSES



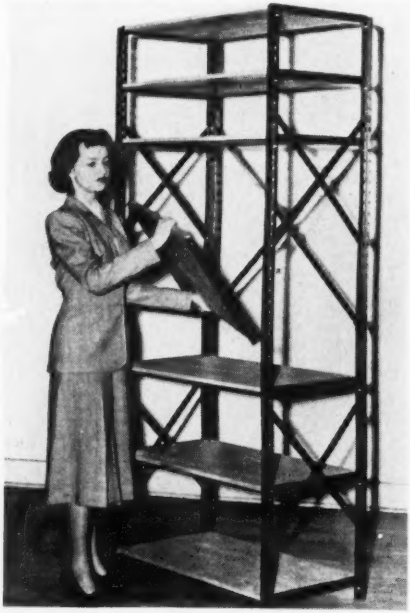
For
Foolproof Production
- Straightening
- Cold Riveting
- Assembling

Simple 100% mechanical construction, you can't overload or wear out. Low maintenance. Easy one-foot operation frees both hands. Many models and attachments save time and cost of special tooling. Profitable production rate within a few hours. Write for catalog.

General **MANUFACTURING CO.**
6433 FARNSWORTH DETROIT 11, MICHIGAN

Adjustable Steel-Wood Shelving

Lyon Metal Products, Inc., 238 Monroe Ave., Aurora, Ill., is now manufacturing a complete line of adjustable steel-wood shelving for use in shops, stockrooms, assembly lines, industrial plants, and institutional buildings. Rigid steel uprights support the hard wood shelves in such a manner that no bolts are used to attach the shelving to the uprights; each shelf is attached by a pressed steel clip that



Lyon Adjustable Steel-Wood Shelving

provides for maximum adjustability and strength.

Easy to install, the steel-wood shelving is available in dimensions of 3 feet in width, 1 or 1½ feet in depth, and 7 feet in height.

Plated Thread Plug and Cylindrical Gages

B. A. Taylor Co., 19334 Monte Vista, Detroit 21, Mich., is now offering a line of jig bushings, taps, die leader pins, lathe mandrels, thread gages and rings, and cylindrical gages, Tanalloy plated to size. According to the manufacturer,

these products are not ground or lapped after being Tanalloy plated but are all plated to size, leaving a very hard surface that is designed to provide for long wear and resist peeling or chipping from the base metal. The plate is claimed to have a Brinell hardness of from 1000 to 1025.

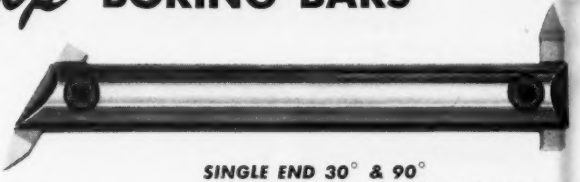
Thread gages are ground from one to four tenths of an inch below basic, and are then Tanalloy plated to size as close to the high limit as possible to allow for maximum wear. After they have been worn to basic not more than 0.0005 inch, they may be returned to the company and stripped of the remaining Tanalloy and plated back to size.

Machine Designed for Direct Optical Reading to 0.00005 Inch

Identified as the Type P324, a Swiss measuring machine which is said to provide direct optical reading to 0.00005 inch without use of micrometer screws is now available from Hauser Machine Tool Corp., 30 Park Place, Manhasset, N. Y. Universal application, simple operation, and direct optical reading of measurements in graduations of 1, 0.1, 0.01, 0.001, 0.0001, and 0.00005 inch are features claimed for the machine, which has a longitudinal and transverse travel of 4 x 4 inches and is designed for use on single-phase 125 to 220-volt current. The net weight of the machine (without stand) is 340 pounds.

Hauser Type P324 Measuring Machine

Shuregrip BORING BARS



DOUBLE END 30° & 90°

Number	1-A	2-A	3-A	4-A	5-A	6-A	7-A
Bar. Dia. In	3/8	1/2	5/8	3/4	1	1 1/4	1 1/2
Length In	7	8	9	11	13	18	23
Cutter In	1/8 Rd.	3/16 Rd.	1/16 Sq.	1/4 Sq.	5/16 Sq.	3/8 Sq.	1/2 Sq.
Price Each	1.95	2.10	2.95	3.25	4.55	10.75	20.80

SINGLE END 30° & 90°

When Ordering—State Angle Required

Number	1-B	2-B	3-B	4-B	5-B	6-B
Bar. Dia. In	3/8	1/2	5/8	5/8	3/4	3/4
Length In	3	4	5	7	8	10
Cutter In	1/8 Rd.	3/16 Rd.	1/16 Sq.	1/16 Sq.	1/4 Sq.	1/4 Sq.
Price Each	1.25	1.35	2.20	2.50	2.60	2.80

Adjustable Boring Bar holders available take bars from 3/8" up to 1 1/2" diameter. T-Blocks made to fit any lathe. Price list on request.

WRITE FOR PRICE ON LARGER BARS

BREAK OFF ON SCORE, AS REQUIRED

1-6" Length—1/8 Dia. H.S.S. Tool Bit Stock—Hardened—each 95¢
1-6" Length—1/16 Dia. H.S.S. Tool Bit Stock—Hardened—each $1.05
Round Tool Bits Furnished in 1-A, 2-A, 1-B and 2-B—All Others Square. 1 Hexagon Wrench Furnished with Each Bar.

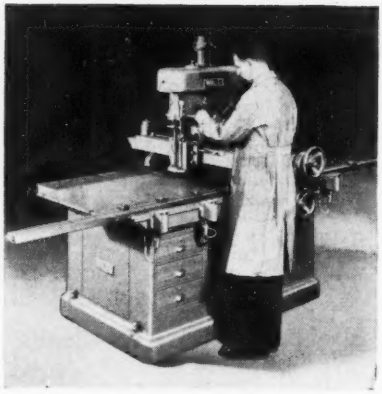
Price of Square H.S.S. Cutter Bits.	1/8 x 1	1/4 x 1 1/4	1/8 x 1 1/2	3/8 x 1 7/8
	.20	.30	.40	.65

J. E. FREYMAN & SONS, INC.
3627 KESWICK RD. BALTIMORE 11, MD.

Machine Drills and Reams Holes in Material up to 36 Inches Wide

The Wales Drilling Machine for precision layout, drilling, and reaming of holes in material of practically any length and up to 36 inches wide has been announced by Wales-Strippit Corp., 398 Payne Ave., North Tonawanda, N. Y. Designed for easy operation, the machine includes a precision built drill head with anti-friction bearings together with guide support which is adjustable veritcally to position the drill and reamer guide bushing close to the top of the work so as to ensure close tolerance accuracy. The extra large bearing area on the drill head assembly base assures travel at exactly 90 degrees on two accurately ground ways across the solid bridge.

The full size table of the machine includes hand scraped ways and is designed to provide complete support for the work, which is firmly clamped to a long slide rail which moves the work left to right under the drill head. Easy movement of the work is afforded by anti-friction ball roller inserts located over the entire table area. Two-speed gearing, controlled by handwheels, provides rapid traverse for rough positioning and slow speed "zeroing in" when locating the drill head on the bridge and locating the work clamped to the slide rail under the drill head. Built-in scales graduated in $\frac{1}{32}$ inch and conveniently located for easy visibility by the operator permit rough locating of the drill head and slide rail. For "zeroing in," dial indicators calibrated in tens of thousands of an inch are used in con-



Wales Drilling Machine

COOLEY HEAT TREATING FURNACES

ELECTRIC BOX TYPE · FLOOR AND BENCH MODELS

For Tools and Small Parts

SHOWN HERE **THE COOLEY FLOOR MODEL for HARDENING AND TEMPERING**

Max. Temp.	Sizes	Price
2000°	12″ x 8″ x 18″ 12″ x 8″ x 24″ 12″ x 8″ x 36″	$985 to $1265

All prices are less controls. Any standard controls available for automatic temperature control.

- With Cooley design, the door is virtually another wall, equally insulated with the others—entire hearth is usable.
- Natural thermal convection.
- Easily removable heating elements.

Brown and Wheelco Control Pyrometers carried in stock—available for all applications.

Free on request: ☐ COMPLETE CATALOG ☐ "SHOP NOTES ON HEAT TREATING"

COOLEY ELECTRIC MANUFACTURING CORP.
34 SO. SHELBY · INDIANAPOLIS, IND.

junction with end measures placed in V-grooves. Air clamp levers rigidly lock both the drill head and slide rail in the exact position desired.

Two sets of hand steel drawers are conveniently located in the base of the machine for accommodating drills, reamers, and other accessories. Eight leveling screws on the bottom of the machine base compensate for uneven floors.

Combination Band Saw and Filer Has Speeds From 40 to 4,000 F.P.M.

The Moessner "Rekord" SSF/350 Combination Band Saw and Band Filing Machine with infinitely variable speeds ranging from 40 to 4,000 feet per minute is now being offered by Ernest Gottschalk Co., Inc., 401 Broadway, New York 13, N. Y. The machine has a 20 x 23-inch table which can be tilted in four directions. Welding of saw ends is accomplished with a built-in welding attachment, and the flash caused by welding can be cleaned up with a built-in grinder. Saw and filing chips are blown off by an air jet provided through a small built-in compressor. A foot operated clutch enables the operator to stop the machine without shutting off the motor. Saw guides, adjusable to all sides, are located above and below the workpiece.

The machine is powered by a 1½ h.p. motor. Saw bands are available in 16-yard lengths and in widths varying from 0.120 up to 0.8 inch. They can also be supplied in exact lengths, already welded, for immediate operation. File bands can be supplied in practically any type of cross-sectional shape.

Moessner "Rekord" SSF/350 Combination Band Saw and Band Filing Machine

Choose your own honing speed with the SUPERIOR HONING MACHINE

Spindle speeds from 250 to 1,150 rpm are possible with the new Superior Honing Machine. Adjustment dial is conveniently located.

Equipped with Superior Hones, the machine is fast, accurate and economical.

- *No pre-dressing of hones.*
- *No mandrel wear.*
- *Larger cutting surfaces.*
- *Accuracy to .0001 over keyways, slots, interrupted holes.*

Write for free literature on Superior Honing Equipment. Our engineers are available to help you with any honing problems.

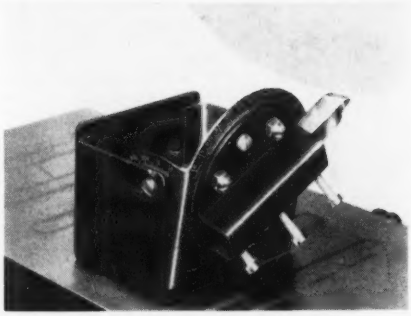
Superior HONES

Are Pre-Dressed — Cut Stock Faster
Have Permanent Mandrels

SUPERIOR HONE CORPORATION
1609 Elreno Street, Elkhart, Indiana

Toolholder for Power Grinder

The AccrAngle Grinder Attachment now being manufactured by Carl Nomann Co., 3537 Greenwood Ave., Los Angeles 22, Calif., is said to make possible the grinding of cutting tools, threading tools, box tools, or any single-point tool with any desired angle of rake or clearance without removing the tool from the holder. Of all-steel construction with easy-to-adjust dials that enable the user to set it quickly for any angle of rake or clearance on any side of the tool to be ground, the attachment is designed to accommodate tools up to ½ inch.



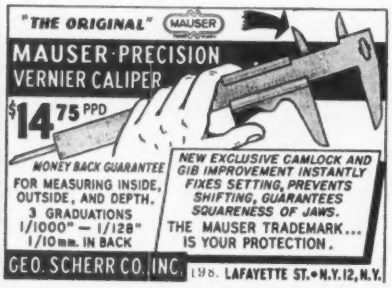
AccrAngle Grinder Attachment

Tools may be ground quickly and accurately by simply placing in the holder, tightening the set screws, and then adjusting the attachment for the desired grinding angle. In addition to being useful for grinding one tool or many tools and small production grinding jobs, the AccrAngle also enables duplicate angles to be ground on tools at any time.

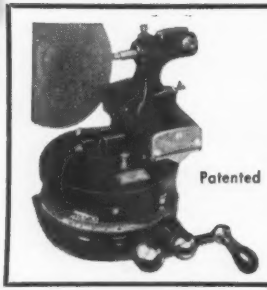
Magnetic Base Indicator Holder Saves Time

The Erick Magna-Holder for all types of indicators has been introduced by Passing Eye, Inc., Kenosha, Wis. Readily applicable to flat, round, or angled ferrous surfaces, the holder includes permanent Alnico magnets which are said to hold it in position with a 30 to 35-lb. pull. Universal settings and immediate indicator readings are made possible by a non-magnetic stainless steel indicator holder arm set in a ball socket.

The Erick Magna-Holder, which weighs 12 oz., is said to provide a quick and convenient means of attaching indicators for checking setups or work on lathes,


"THE ORIGINAL"
MAUSER
MAUSER-PRECISION
VERNIER CALIPER
$14.75 PPD
MONEY BACK GUARANTEE
FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.
3 GRADUATIONS
1/1000" — 1/128"
1/10mm. IN BACK
NEW EXCLUSIVE CAMLOCK AND GIB IMPROVEMENT INSTANTLY FIXES SETTING, PREVENTS SHIFTING, GUARANTEES SQUARENESS OF JAWS.
THE MAUSER TRADEMARK... IS YOUR PROTECTION.
GEO. SCHERR CO., INC. 198 LAFAYETTE ST. • N.Y. 12, N.Y.

HARDENED and GROUND HSS BLANKS
Any decimal diameter to ½"—in any length.
Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.
Write for price list D-2
WILLIAM T. HUTCHINSON COMPANY
235 Main St. Orange, N. J.



Now! **THE AUTOMATIC ANGLE TANGENT TO RADIUS DRESSER**

That Eliminates Breaks in Profile at Points of Tangency.
NO TEMPLATES OR CRUSHER ROLLS REQUIRED!

The Jeon Dresser will dress a radius either concave or convex, with angles absolutely tangent on either or both sides of the arc, IN ONE CONTINUOUS OPERATION. Also, any combination of angles or arcs. *Write for Price and Folder.*
Dealers' Inquiries Invited

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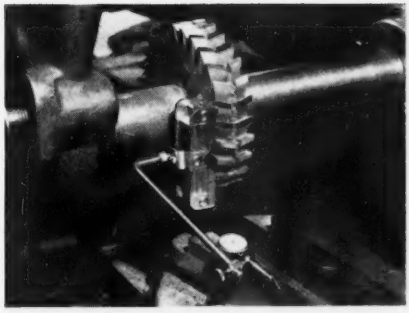
Post Office Box 6750 **Washington 20, D. C.**



Erick Magna-Holder in use

milling machines, shapers, grinders, or wherever dial or other indicators are used.

Wax Insert Facilitates Blind-Hole Tapping

A hard wax insert that is said to eliminate the many time-consuming annoyances of blind-hole tapping is now being marketed under the name of Tap-Cartridge by the Tap-Cartridge Co., 4208 Airport Rd., Cincinnati 26, Ohio. Available for tap sizes from No. 6 up and for any depth of drilled hole, the insert, it is claimed, prevents torn threads, increases tap life, and facilitates thread cutting to the very bottom of a hole without any cleaning-out delays.

The accompanying illustration shows the manner in which a blind hole is tapped using a Tap-Cartridge: (A) drilled hole; (B) Tap-Cartridge inserted; (C) hole is tapped through Tap-Cartridge,

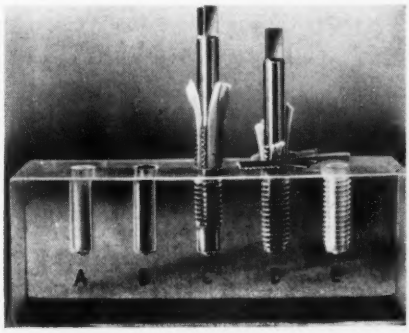


Illustration showing manner in which blind hole is tapped using Tap-Cartridge

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C
1A, 4C
5C

480
(AC-50)

All collets in hexagon, square and round.

KLUTCH-KOLLET
Step collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND
CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR
½" cap.

Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.

HAND DRAWBAR
½" cap.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

LIVE CENTER
(Ball Bearing) Double sealed for accuracy.

KASSON Precision

KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!

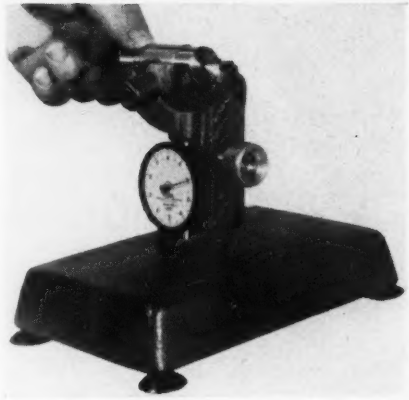
GENERAL DIE AND STAMPING CO.
Integrity Since 1919
264 MOTT STREET • NEW YORK 12, N. Y.

chips being embedded in the wax and forced up and out of the hole; (D) tap has reached bottom of hole without any chip interference; (E) completed tapped hole.

Comparator Gage Features Three-Point Controlled Accuracy

The Troy Precision Tool Co., P. O. Box 52-29, Welshfield, Ohio, has announced a comparator gage, designated as the Series AO, featuring three-point controlled accuracy. Since three strategically located contact points are utilized, the mere rotation of a shaft on a gage is said to automatically effect inspection for out-of-round characteristics or "cloverleaf." Accuracy of the gage is claimed to be within 0.0000250 inch.

The gage is available in 21 sizes covering a range from $\frac{3}{8}$ to $\frac{3}{4}$ inch in $\frac{1}{16}$-inch increments and from $\frac{3}{4}$ to 6 inches in increments of $\frac{1}{4}$ inch. Each size is adjustable within its range and can be set by means of hardened, ground, and lapped setting masters. For on-the-machine inspection, the gage can be furnished with a lightweight cast aluminum body for easy handling; or, it can be furnished with a sturdy cast iron mounting base to facilitate production inspection. Compensation is made in the gage to provide for direct reading of shaft diameter even though it is not measured on a 180-degree plane. The gage is normally supplied with a Federal dial indicator but can be furnished without an indicator when specified.



Troy Series AO Comparator Gage

ETALON No. 17

HARDENED STAINLESS STEEL

Known the world over for fine accuracy. Hand fitted vernier assures smooth, snug operation. COMPLETELY GUARANTEED. Supplied in ENGLISH or ENGLISH and METRIC Graduations. Furnished in handsome form fitting wooden case.

ALINA CORPORATION • 32 Broadway • New York 4, New York

Gentlemen: Please send me the following:

☐ Etalon Universal Vernier Caliper as shown $19.95 payment with order (check, money order) or C.O.D. (specify type graduation).

☐ Descriptive catalog listing all Etalon tools.

Name.....

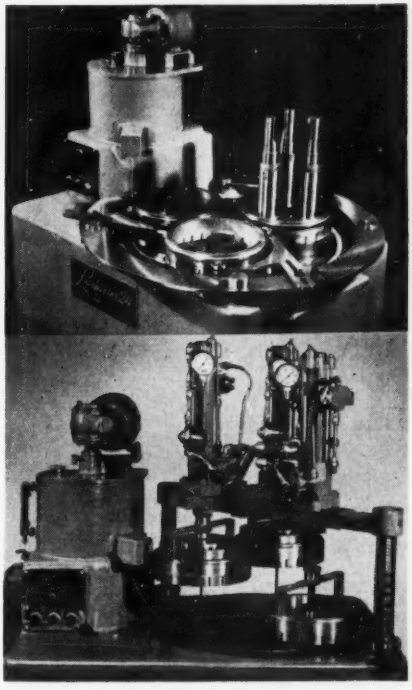
Address.....

City..... State.....

ALINA CORPORATION • 32 Broadway • New York 4, New York

Attachments Speed Lapping of Special Parts

To speed production and simplify handling of certain types of parts on its "Lapmaster" lapping machine, Crane Packing Co., Dept. H-3, 1800 Cuyler Ave., Chicago 13, Ill., has introduced two special attachments, a "roller bar" attachment and pneumatic lift attachment. The roller bar attachment is designed primarily to facilitate loading and unloading of tall or



(Above) Standard "Lapmaster" equipped with "roller bar" attachment for retaining and adjusting lap plate conditioning rings. (Below) Standard "Lapmaster" equipped with pneumatic lift attachment for raising and lowering the conditioning ring-pressure plate units.

large parts. Instead of the standard overhead spindle bar of the machine, the attachment makes use of brackets mounted outside the circumference of the lap plate. Elongated slots allow adjustment of these conditioning ring holding brackets. With this arrangement, complete accessibility of the lap plate is said to be afforded, the

Vimcolight In Use on a Rivett 608 Lathe

VIMCO Light

Offers a

DOUBLE PLUS VALUE

+ FOR YOU:

Vimcolights help machine tool designers maintain top machine performance by preventing eye fatigue. And good performance means good will . . . **means satisfied customers and repeat sales** for you.

+ FOR YOUR CUSTOMERS:

Adequate, non-glare light on the vital work area helps prevent costly rejects . . . unnecessary injuries . . . and waste production time. Help your customers save money . . . **install Vimcolights as original equipment!**

Vimcolights are sturdy, versatile, and easy to install. Special applications handled by our engineering staff. Bulletin 74 illustrates our complete line.

VIMCO MFG. CO., Inc.

SINCE 1919

111 Brayton Street Buffalo 13, N. Y.

height of parts handled is claimed to be unlimited, and, in most cases, large heavy castings are said to lap of their own weight.

Where large numbers of small parts are to be lapped, the pneumatic lift attachment is designed to speed production by facilitating loading and removal of parts and workholders. Each conditioning ring and pressure plate unit is individually raised by a pneumatic lift. When the automatic lapping cycle stops, each lift is quickly raised by means of pneumatic pressure, lapped parts are removed, and preloaded workholders are placed in position.

Hand Grinder Has Sufficient Power for Variety of Jobs

Known as the "Hi-Power Grinder," a powerful hand tool for heavy production

Chicago "Hi-Power Grinder"

work has been introduced by Chicago Wheel & Mfg. Co., Dept. MMS, 1101 W. Monroe St., Chicago 7, Ill. Designed for constant duty without slowdown, the tool is said to be ideal for industrial plants, pattern shops, foundries, die shops, garages, and other places under a variety of conditions. Operating at 20,000 r.p.m., the grinder is said to maintain the speed required for difficult grinding jobs.

The motor of the unit is independently mounted and can be easily detached from its handpiece. Other features include an independent ball bearing spindle and forced-air ventilated handpiece. The tool has a universal Jacobs chuck with ¼-inch capacity which permits the use of a 2-inch grinding wheel or ¼ and ⅛-inch shank mounted wheels (including sanding drums, wire brushes, felt and soft rubber polishing wheels). Measuring 11 inches long overall and weighing 5 lb. 10 oz., the grinder is available in two

SAVE WITH
PYOTT
QUE-DEE
CAST-IRON
PULLEYS

Pyott Que-Dee (quick detachable) Flat Belt Pulleys offer the same economies and time-saving advantages in assembly and field operations as Pyott Que-Dee Sheaves. The Taper-Tight Bushing, with standard keyway, slips easily over shaft. The tapered hub of the Que-Dee Pulley slides easily into position on the Taper-Tight Bushing. Three bolts pull pulley bushing and shaft into a positive powerful pull-up fit. For dismounting, the same bolts, inserted in demounting holes, act as jack screws to loosen pulley.

Immediate Delivery in popular diameters and face widths from complete factory stocks or your mill supply.

WRITE FOR CATALOG 80

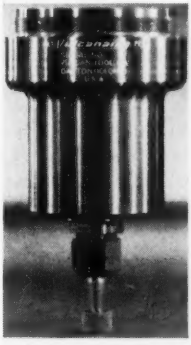
PYOTT FOUNDRY & MACHINE CO.

333 NORTH SANGAMON STREET • CHICAGO 7, ILLINOIS

models—No. 3500 for operation on 110-220 volt 25-60 cycle a.c.-d.c. and No. 3505 for operation on 220-volt 25-60 cycle a.c.-d.c. The tool is furnished complete with eight accessories, including mounted wheels, sander, chuck key, and dressing stone.

Spindle Unit Adaptable to Variety of Grinding, Milling, and Finishing Applications

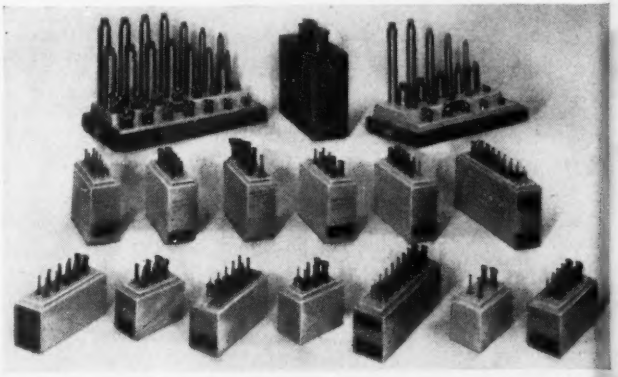
Measuring only 3 5/16 inches long, a precision grinding spindle employing an infinitely - controlled high speed air-operated and cooled motor is now being



"Vulcanaire" Precision Grinding Spindle

offered under the "Vulcanaire" trade name by Vulcan Tool Co., 731 Lorain Ave., Dayton, Ohio. According to the manufacturer, the spindle can be adapted to practically any machine for the high precision production finishing of contours on hardened steel working surfaces of cams, fingers, or levers; burring or milling die castings; carbide milling or finishing slots; and other operations. Using carbide mills, a 10 micro-inch finish is said to be obtained on workpieces, and with mounted points a 6 micro-inch finish is claimed to be readily obtained on parts.

With room temperature air and oil continually circulating through the motor of the spindle, heat and expansion are controlled. All parts of the unit are made of alloy steel, machined and ground to assure excellent balance. The length of the spindle allows it to be easily adapted to a machine, using a minor part of the machine capacity.



The work you produce on your jig boring machines can be no better than the boring tools you use.

Bokum Boring Tools are designed with a combination of a helical and radial backed-off form of cutting and clearance angles, based on a mathematical formula that guarantees fine finishing boring, without chattering, throughout the long life of the tools.

(1) Put up in choice of 16 different sets (shown above). Send for Cat. Supplement 1.

(2) Available in 3 cutting materials (a) super high speed steel, Cat. B-1139-6; (b) carbide tipped, Cat. B-348; (c) solid carbide, Cat. B-948.

(3) Sizes range to bore holes from 1/16" dia. up.

(4) Resharpening fixtures that insure long life of tools and tops in performance. Cat. B-AB1 and B-AB412.

(5) Tool holders, vertical adjustment and fixed position. Cat. B-483.

TRADE MARK REG. U. S. PAT. OFF.

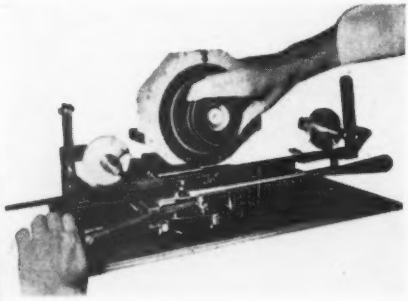
BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

Hot Stamping Machine Embosses Individual Letters and Numbers

Designated as the Acromarker Model No. 1H, a hot stamping machine for baked enamel metals, plastic, fiber, wood, paper, and other materials developed by The Acromark Co., 90 Morrell St., Elizabeth 4, N. J., is designed to emboss numbers or letters in color by the use of a roll leaf transfer tape. The die wheel, which contains 40 individual interchangeable and replaceable characters, is enclosed in rock-asbestos insulation except for the bottom section where hot stamping is performed. An insulated handwheel or turning knob is used to rotate the die wheel for the selection of characters being stamped. A frame extending both right and left carries the transfer tape feed roll and rewind roll of used color tape. Adjustment is provided for tape feed control, with guides directing the color tape immediately under the dies. Heat for the die head is provided by ring type heating elements in the die head which are designed for plugging into regular 110-220 volted a.c. electrical outlets. A thermometer in the die head provides for visable temperature control.



Acromark Model No. 1H Hot Stamping Machine

The machine measures 28 inches wide x 16 inches high x 18 inches deep (without base board, 12 inches). Dies with from $\frac{1}{16}$ to $\frac{5}{16}$-inch size characters are accommodated in the Model No. 1H; however, a larger Model No. 7H provides die sizes up to $\frac{5}{8}$ inch.

Machines Arranged for Wet Cutting Off of Solid Bars and Tubing

Campbell Machine Division, American Chain & Cable Co. Inc., 931 Connecticut Ave., Bridgeport 2, Conn., has announced

Save Costly Time of Operators, Engineers, Draftsmen with

CARTER Guide-Line Lights

● This light casts a definite shadow-line or light line in a fixed position, establishing path of saw for proposed cut or base line for designing. Saves costly time, frustrating work for mechanic and stops measurement spoilage.

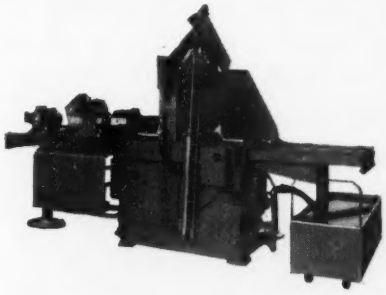
New Literature FREE

For Wood, Plywood, Plastics

Scores successful installations on straight line sawing operations, veneer lay-up, veneer panel matching, tenoners, drafting rooms, meat cutting plants.

CARTER PRODUCTS CO., INC. **47 Mt. Vernon, N.W. Grand Rapids, Mich.**

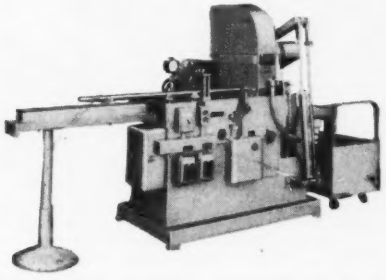
two wet abrasive cutting machines designated as the Models 508 and 270 respectively. The Model 508 is a revolving



Campbell Model 508 Wet Abrasive Cutting Machine

work bar type machine with oscillating abrasive cutting wheel, hydraulic wheel feed, and hydraulic work clamps for cutting solid bars up to 8 inches in diameter and tubing up to 8 inches o.d., either ferrous, non-ferrous, or plastic materials, including corrosion-resisting as well as hardened or annealed steel. Temperature of the work is controlled by proper distribution of coolant, and the machine is said to cut all solids or tubing with a minimum of burr.

The Model 270 is a fully automatic wet cutting unit for cutting up to 2-inch diameter solid annealed or unannealed steel and 3½-inch diameter tubing. Since the unit is sequence timed, no adjustment of the time cycle is said to be required re-

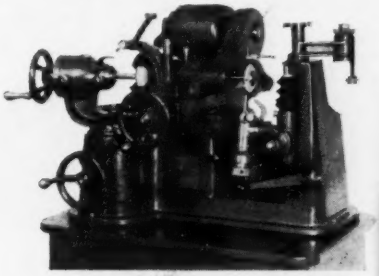


Campbell Model 270 Wet Abrasive Cutting Machine

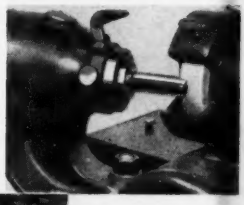
gardless of the size of stock being cut or the length of the feed up to 12 inches. The entire operation of the machine is

HYBCO

TAP GRINDER



MODEL 1100



• **Capacities No. 0 Machine Screw to 1½" Hand Taps.**

Henry P. Boggis & Co.

708 East 163rd Street
Cleveland 10, Ohio

"TENDERIZE"

TOUGH BORING JOBS ON TURRET LATHES with

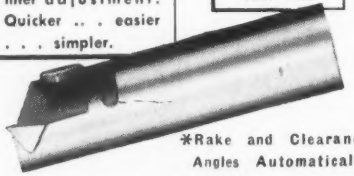
BORING BARS

Soften up tough production boring problems with EVEREDE modern HSS or solid carbide *Pre-formed triangular tool bits. Save up to 75% on grinding time and costly diamond wheel wear. Get greater tool-bit life and usefulness . . . cut tool-bit costs and inventory. These are but a few of the plus-values which have switched so many of America's critical plants to EveredE boring. The complete story may mean a lot to you, too. Send for it today.

Greater Precision ...Faster Production ...at Much Less Cost

. . . BECAUSE EveredE exclusive wedge-action bit-clamping and adjusting set-screw insure POSITIVE SETTING . . . without back-up. Permit finer adjustment. Quicker .. . easier . . . simpler.

The ONLY Boring Bars utilizing *Pre-formed TRIANGULAR Solid Carbide Tool Bits



*Rake and Clearance Angles Automatically Provided.

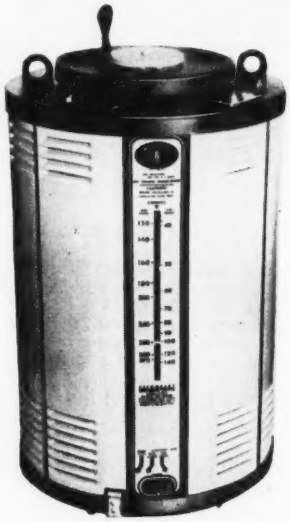
EVEREDE Tool Co.

2000 North Parkside Avenue
Chicago 39, Illinois

completely automatic, including stock feed, clamping, wheel feed, adjustment for wheel wear, and ejection of cut pieces.

Arc Welders Available as Indoor or All-Weather Models

Air Reduction, 60 E. 42nd St., New York 17, N. Y., has announced 300, 400, and 500-ampere Wilson "Bumblebee"



Wilson "Bumblebee" Transformer Arc Welder

Transformer Arc Welders available as indoor or all-weather models. All models are of sturdy, compact construction and light weight and feature instant arc starting, wide current range, easy-to-operate controls, and minimum maintenance.

Automatic "Hot-Start" controls with arc-stabilizing capacitors are provided on the 300 and 400 models. Current ranges are 60 to 375 for the 300-ampere model, 80 to 400 for the 400-ampere model, and 100 to 675 for the 500-ampere model. The Silicone insulation used in each welder is water repellent and is said to provide for safe operation at high temperatures without breaking down. In addition, the light weight resulting from the use of Silicone insulation is claimed to make the welders ideal for mounting on running gear for portability.

Punch Press Feeder Is Designed to Prevent Hand Injuries

Industrial Products Co., 2999 N. 4th St., Philadelphia 33, Pa., has announced an improved vacuum lifter for punch

Ipco Punch Press Feeder

press feeding and other production uses. Designed to prevent finger and hand injuries and to speed up work, the device is said to be practical for use with both high and low stroke punch presses in lifting, feeding, and positioning blanks without inserting the hands or fingers within the danger zone. It is also said to be useful for rapidly transferring blanks from piles or stacks, especially when they are oily or greasy and difficult to grasp with the fingers.

Light and easy to to handle, the Ipco Punch Press Feeder may be used on all non-porous rigid materials and is claimed to respond instantly. A slight blow affixes the vacuum cup to the blank being handled, and the feeder may be instantly released by depressing a thumb lever. The device measures 15 inches long overall and is available in cup diameters of 1½, 2½, and 4 inches.

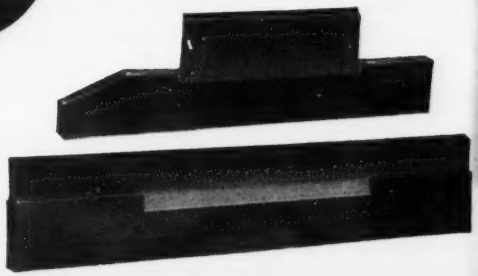
Plymetal Brazing Shims

Two grades of preclad silver brazing alloys are now available through Steel Sales Corp., 3348 S. Pulaski Rd., Chicago 23, Ill. These alloys are marketed under the trade names of Silvaloy 5631 and Silvaloy 2501 and are composed of a given thickness of copper, clad both sides with low temperature silver brazing alloys.

Silvaloy 5031 is clad with grade Silvaloy 503 which has a melting point of 1,195 deg. F. and a free flow of 1,270 deg. F. Silvaloy 2501 is clad with grade Silvaloy 250 which has a melting point of 1,222 deg. F. and a free flow point of 1,416 deg. F. Silvaloy 5031 plymetal is available in

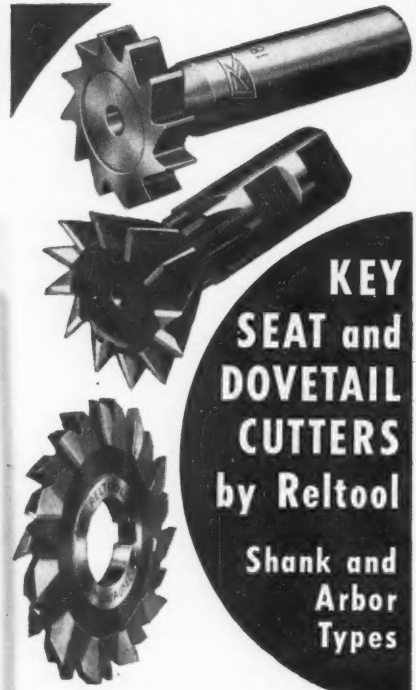
WILLEY'S
TUNGSTEN CARBIDE
TOOLS

CARBIDE TIPPED
Work Support Blades
for CENTERLESS GRINDERS



Standard thrufeed and infeed work support blades available from stock. Prices on special blades quoted on receipt of prints.

WILLEY'S CARBIDE TOOL CO.
SOLE MAKERS OF WILLEY'S METAL
1342 W. Vernor Highway Detroit 1, Michigan



KEY SEAT and DOVETAIL CUTTERS by Reltool

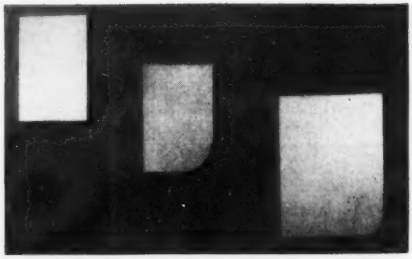
Shank and Arbor Types

• Woodruff Key Seat Cutters by Reltool are furnished in both Shank and Arbor Types. Right Hand Cut, shank type, carried in stock; Left Hand Cut, *special*. Arbor Type Keyseat Cutters have staggered teeth, with side teeth relieved for narrow margin.

• Reltool Dovetail Cutters, Shank Type, are designed to take the place of arbor type and threaded hole angle cutters . . . for use in Reltool End Mill Holders.

The Reltool Line Includes: Arbors • Center Drills • Counterbores • Die Sinking Cutters • Dovetail Cutters • End Mills • Form Tools • Gear Cutters • Hollow Mills • Keller Cutters • Key Seat Cutters • Lathe Mandrels • Metal Slitting Saws • Milling Cutters — all types • Reamers • Spotfacers • Step Drills • Taps • Tool Bits • Specials. Write for Catalog 50.

Reltool CORPORATION
RELIABLE METAL CUTTING TOOLS
4540 W. BURNHAM ST. • MILWAUKEE 46, WIS.



Silvaloy Brazing Shims

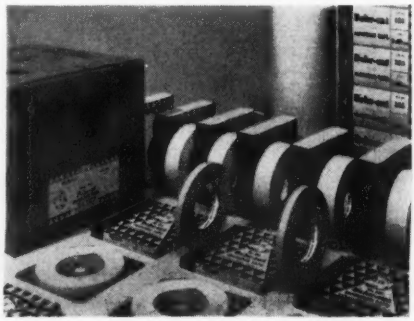
three thicknesses; namely, 0.020 inch (0.010-inch thick copper, clad both sides with 0.005-inch thick silver brazing alloy), 0.016 inch (0.008-inch thick copper clad both sides with 0.004-inch thick silver brazing alloy), and 0.011 inch (0.005-inch thick copper, clad both sides with 0.003-inch thick silver brazing alloy).

Plymetals are available in all standard tungsten tool sizes and are furnished with or without radii as desired. They are also furnished in coiled strip ⅛ to 3 inches wide inclusive.

Masking Tape

Behr-Manning Corp., Troy, N. Y., is now offering, for industrial application, a line of paper-backed pressure-sensitive tapes under the trade name of "Behr-Cat." Designed for a wide variety of applications, the tapes are adapted to masking, as in spray or brush painting; stenciling, as in screen or stencil painting; packaging, as for shipment or storage; sealing, as for dustproof containers; holding, as for loose parts in assembly; label-

Illustration showing assorted rolls of "Behr-Cat" Brand Masking Tape



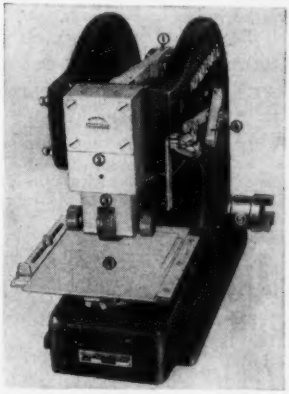
ing; surface protection, and so on.

Behr-Cat Brand Masking Tapes are available in standard length rolls of all popular widths, boxed or bulk packed.

Bench Crank Press Designed for Numbering, Marking, and Stamping

Designed for use in stamping name plates and small parts, eliminating the use of a power press, a bench crank press announced by Numberall Stamp & Tool Co., Huguenot Park, Staten Island 12, N. Y., includes a ram head that is designed to accommodate type holders, numbering heads, and special dies. A tripping attachment can be supplied for use with automatic numbering heads for consecutive numbering.

The press, which requires a bench space of 16 x 10 inches, has a throat depth of 6 inches and a vertical table adjustment of 1¼ inches. The unit, which weighs approximately 125 lb., is available in three models. The Model 131 is hand operated by a lever and is described as powerful and easy to operate. The Model 132 is operated by a 3-inch air cylinder, operation being controlled by a four-way hand or foot valve, and is said to be ideal for stamping up to ten ⅛-inch characters in aluminum plates. The Model 133 is



Numberall Model No. 133 Bench Crank Press

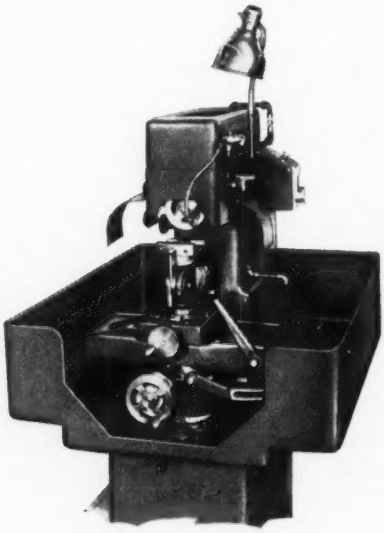
operated by a motor through an eccentric having a releasing device which allows the machine to stamp once each time the

AIR PRESSES
NEW MEAD INDUSTRIAL
AIR POWER
CATALOG Ready!
WORK FEEDERS
AIR VISES
AIR CYLINDERS
MIDGET AIR-CLAMPS*
Full of Suggestions for FASTER, CHEAPER PRODUCTION!
Illustrates, describes Air Cylinders, Valves, air operated Presses, Vises, Chucks, Hammers, Drill Press Feeds, Work Feeders, Timers, semi-automatic combinations, etc.
*Pneumatic Cylinders.
Write for Complete Catalog!
MEAD SPECIALTIES CO., 4114 No. Knox Ave., Dept. AA-71, CHICAGO 41, ILLINOIS

control lever is depressed. If the control lever is held down, the press stamps continuously.

Wet Grinder Designed for Chip Breaker Grinding and Diamond Finishing

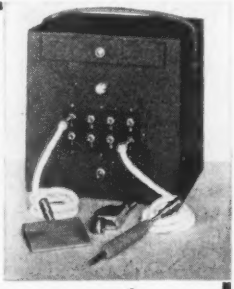
According to Hammond Machinery Builders, Inc., 1615 Douglas Ave., Kalamazoo, Mich., a recent addition to the Hammond of Kalamazoo line of carbide tool grinders is the Model CB-77-W Wet Combination Chip Breaker and Diamond Finishing Grinder shown herewith. The cup wheel side is for diamond finishing purposes.



Hammond Model CB-77-W Wet Combination Chip Breaker and Diamond Finishing Grinder

The chip breaker side is not only for grinding chip breakers but is also designed for use with the new Hammond "VC" solid carbide insert grinding fixture. Coolant is provided by a self-contained pump and tank unit, and coolant spouts can be swiveled to direct coolant to any desired point.

MARK IRON, STEEL and CARBIDES



THE Etchograph WAY

Original Electric Etcher. Thousands In Daily Use

Mark *hardened parts*, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly. • Three sizes to meet all requirements.

• *Write for circulars and prices.*

BREWSTER-SQUIRES CO.

P. O. Box 191 Tenafly, N. J.

THE CRALEY OFFSET BORING HEADS

- Note depth of bearing.
- Tool carrying block most accurately fitted of any boring head made.
- Large graduated dial screw—easily read calibrations.
- Note minimized overhang.
- Tension screws on opposite sides and ends of block—all cutting strain thrown against solid metal.
- Nine sizes.
- 20 years of Craley experience specializing in boring heads.

Write for illustrated Catalog MS.

C. C. CRALEY MFG. CO.

SHILLINGTON PENNSYLVANIA

Lightweight Grinding Wheel Bushing Features Uniformity of Size

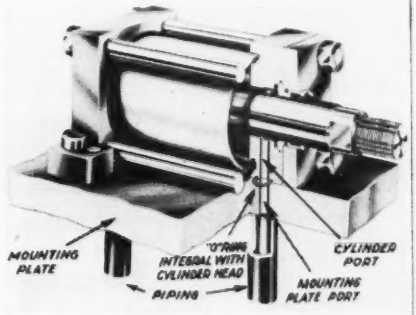
A precision bushing for grinding wheels announced by Norton Co., Worcester 6, Mass., is designed for mounting by the

Norton Precision Grinding Wheel Bushings

press-fit method and features light weight and uniformity of size—features that are claimed to preserve the inherent balance of wheels made by Norton's new manufacturing process. Moreover, the bushing is said to maintain consistent hole size from wheel to wheel with consequent advantages of uniform mounting conditions for the user.

Cylinder Mounting Saves Time

Quick, easy installation of air and hydraulic cylinders singly or in space-sav-

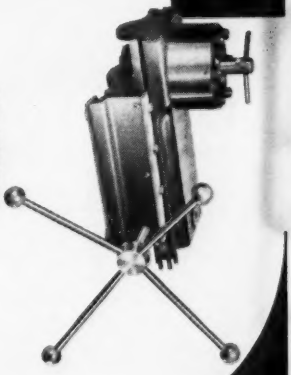


Miller "0" Ring Cylinder Mounting

ing side-by-side manifold mounting without the time, labor, and expense of mak-

CONVERT YOUR LATHE FOR PRODUCTION

You can convert your lathe to handle profitable turret lathe and screw machine work by installing a self-indexing Newton Precision Bed Turret. All production operations can be performed, plus operations normally done with the regular tailstock. ☆ It's designed for fast, heavy duty operation, accommodates six tools and offers precise repeating accuracy. The slide and bed have ground bearing surfaces to assure stroke accuracy. ☆ Investigate the profitable opportunities offered by a Self-Indexing Newton Precision Bed Turret. Available in lever-operated or pilot wheel models for the following lathes: 10" and 11" Logan, 10" Powr-Kraft, 10" Atlas, and 12" Craftsman. ☆ Favorable delivery dates. Ask your dealer for information or write direct.



A. K. TOOL COMPANY 2029 Blake Avenue • Los Angeles 39, California

ing the actual pipe connections to the cylinders is an important advantage claimed for a unique "O" ring cylinder mounting now being offered by Miller Motor Co., Dept. M, 4027 N. Kedzie Ave., Chicago 18, Ill. The air or hydraulic piping is directly connected to ports in a machined flat surfaced mounting plate or manifold and the cylinders are mounted on this plate with their ports mating in accurate alignment with the mounting plate ports. "O" ring seals at the mating surfaces of the cylinder ports are said to assure a leakproof seal under pressure and suction.

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N.A.M. Pioneer Award Given to Gray

Most modern Nibbler for Template Cutting, Tool Rooms, Shipbuilding, Aircraft Parts, Aircraft Tubing, Sheet & Plate Shops.

GRAY MACHINE CO.

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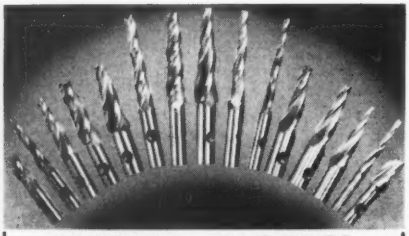

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Long, Durable Performance.

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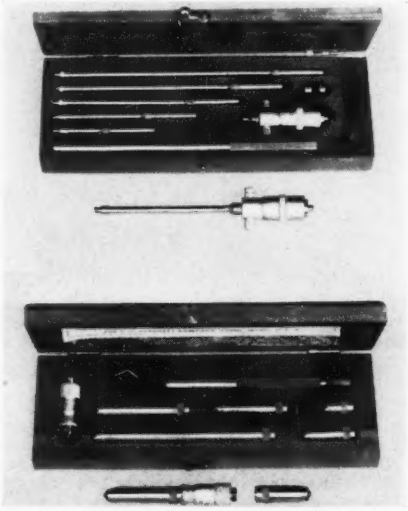
CONICAL TOOL CO.

3802 Buchanan S.W., Grand Rapids 8, Mich.

Inside Micrometers Have No-Glare Satin Chrome Finish

Designated as the Nos. 124 and 823, two inside micrometers announced by The L. S. Starrett Co., Athol, Mass., are described as highly useful precision tools for internal measurements, such as measuring cylinders and rings, setting calipers, comparing gages, measuring between parallels, and so on. Both micrometers feature a satin chrome finish which is said to make micrometer markings stand out sharp and clear in any illumination. Both micrometers also feature quick-reading graduations in thousandths of an



(Above) Starrett No. 124 Inside Micrometer with solid rods. (Below) Starrett No. 823 Inside Micrometer with tubular rods

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The IMPROVED Compound Lever Shears

ALL ALLOY FULLY GUARANTEED

Two Sizes

PORTABLE

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.

BREMIL MFG. CO.

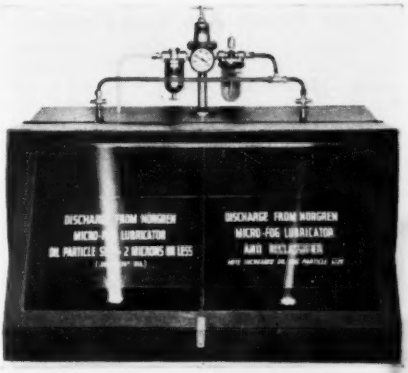
1400 Pittsburgh Ave., Erie, Pa.

inch, with all thousandths lines numbered for fast, error-proof reading. In each micrometer, the screw is made with threads hardened, stabilized, and ground from the solid for maximum accuracy.

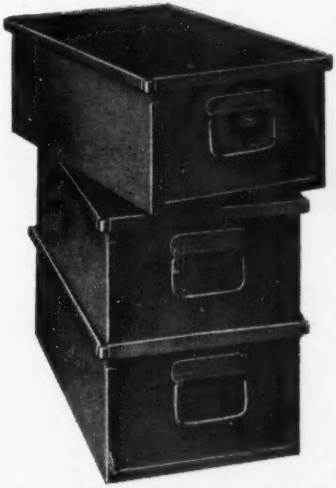
The No. 124 micrometer is designed for use with interchangeable solid rods and is available in four different model sets covering a range of from 2 to 32 inches. The No. 823 micrometer utilizes tubular rods and is available in two sets providing a range of from 1½ to 8 inches and 1½ to 12 inches respectively.

Lubricator Is Said to Create Oil Particles of 0.00007874-Inch Diameter

The Norgren Micro-Fog Lubricator illustrated herewith, product of C. A. Norgren Co., 222 Santa Fe Dr., Denver 9, Col. is said to create an airborne aerosol composed of oil particles 0.00007874 inch and smaller (2.0 micron or less) in diameter. Completely automatic, the unit, according to the manufacturer, is designed to solve difficult lubrication problems on many types of industrial operations by creating a true fog that (1) remains in suspension for a long period; (2) may be carried great distances; (3) provides uniform distribution of oil fog to many outlets; (4) effects a thorough lubrication job, even on the most closely-fitted moving parts; (5) requires minimum air flow; (6) minimizes the possibility of oil flooding the lines and tools; and (7) provides precision flow control down to as little as one drop of oil in 20 minutes if desired. Reclassification of the fine oil particles at the point of application is said to make the fog wettable to almost any desired degree.



Norgren Micro-Fog Lubricator



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- Quick delivery of sizes to your exact specifications
- Other type boxes made on request

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ADVANCE METAL PRODUCTS CORP.

1718 S. NORMAL **CHICAGO 16, ILL.**

Gage Blocks Are Burr-Proofed

Intended for use as laboratory masters, the DoAll "AA" Grade Gage Blocks now being offered by The DoAll Co., Des Plaines, Ill., provide a means of checking working gage block sets, precision comparators, and other precision gage instruments. Said to have an accuracy of ± 0.000002 inch, the blocks are available in 37 and 83-piece sets and are claimed to easily meet the specifications set up by the National Bureau of Standards with regard to size, flatness, parallelism, surface finish, hardness, and stability. In addition, they are "Burr-Proofed" to prevent nicks and burrs on gaging edges through ordinary use.

DoAll "AA" Grade Gage Block Set

The company also has available a completely integrated set of gage block accessories, such as gage holders, scribers, dial indicators, and so on, which are designed to increase the use of gage blocks so that snap gages, height gages, and similar instruments can be assembled with the gage blocks.

Single-Pad Air Sander Has Straight-Line Action

A straight-line action single-pad air sander for use by auto body refinishing shops and other metal-working shops, as well as in industries handling non-metallic materials, has been announced by Sundstrand Machine Tool Co., Pneumatic Division, 2539 11th St., Rockford, Ill. Due to its straight-line action, the sander is said to leave no swirls or pressure marks on surfaces being sanded. Moreover, the unit may be operated both wet and dry,

ALLEN AIR OPERATED DIAL FEED TABLES

MODEL 11EA and 11EB
• Working Mechanism Completely Enclosed
• Rock and Gear Drive
• Adjustable from 4 to 24 index
• Guaranteed Against "Override"
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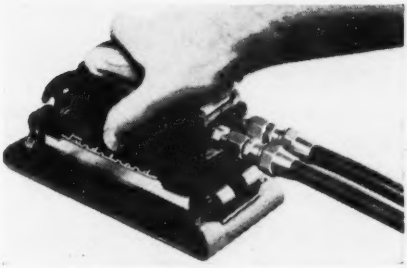


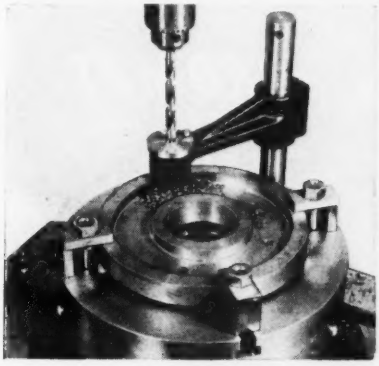
Sundstrand Single-Pad Air Sander

thus making it suitable for use in a wide variety of finishing operations, such as removing grinder marks, feather-edging, scuffing old paint, wet or dry sanding primer coats, and lacquer color coat sanding.

Small and compact, the sander, it is claimed, is unusually easy to handle and can be used with equal ease on both flat and curved surfaces.

Rotary Tables Available with Drilling Attachments

Troyke Mfg. Co., Inc., 4422 Appleton St., Cincinnati 9, Ohio, has announced that its worm wheel operated tables are now available with a drilling attachment which can be used for drilling jobs of the type shown in the accompanying illustration without the use of a drill jig. The arm of the attachment includes a removable bushing at the end having a stand-



Troyke Worm Wheel Operated Table with drilling attachment set up for use

THE HELIOS

Guaranteed Accuracy

$10.50

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Six staggered cutting edges give shearing cut that eliminates all chatter.

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GROBET FILE CO. of AMERICA, INC.

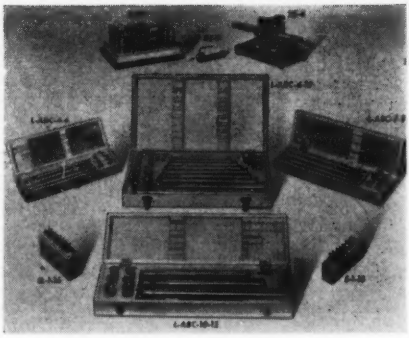
421 Canal Street N. Y. 13, N. Y.

ard ¾-inch hole into which bushings for the required drill size can be inserted. The drilling attachment can be supplied for all rotary tables from 12 to 25 inches in diameter.

Lathe Cutting Tools Available in Sets

Bokum Tool Co., 14775 Wildemere Ave., Detroit 21, Mich., has announced that the large sizes of its cutting tools for lathes are now available in sets compactly arranged in sturdy wooden boxes. Set L-ABC-4-6 contains three different size cutters each of Styles A, B, and C, together with three shanks that fit each respective size of cutter. All styles are interchangeable. The Style A cutter is used for general boring; the Style B for bottoming and facing. The minimum boring diameter range is 11/16 to 15/16 inch. The Style C for internal threading covers a minimum minor diameter thread range of from ¾ to $1\frac{1}{32}$ inches.

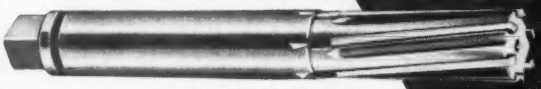
Set L-ABC-7-9 contains three size cutters each of Styles A, B, and C, all interchangeable on the three different size shanks included. The minimum boring diameter range of Styles A and B is $1\frac{1}{16}$ to $1\frac{7}{16}$ inches. Style C has a minimum



Bokum Lathe Cutting Tool Sets

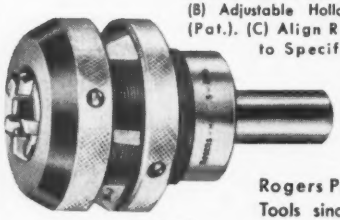
minor diameter thread range of 1 5/32 to $1\frac{3}{8}$ inches. Set L-ABC-10-12 contains three size cutters each of Styles A, B, and C, all interchangeable as in the case of the previously mentioned sets. The minimum boring diameter of Styles A and B ranges from 1½ to 2 inches. Style C has a minimum minor diameter thread range of 1 9/16 to 2¼ inches. Set L-ABC-4-12 is a complete assortment of all cutting tools contained in the three sets des-

ROGERS TOOLS



A

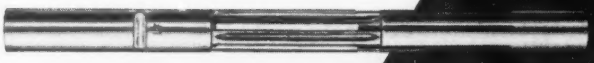
(A) Adjustable Blade Reamers. (B) Adjustable Hollow Mills (Pat.). (C) Align Reamers to Specification.



B

Rogers Precision Tools since 1885.

PROMPT DELIVERY



C

Openings for representatives in several large cities. Write for information.

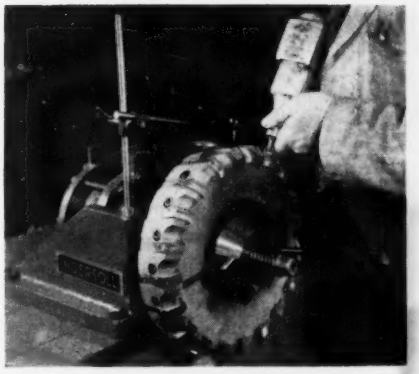
THE JOHN M. ROGERS TOOL CO., GLOUCESTER CITY, N. J.

cribed above—nine sizes of three tools or 27 tools in all.

In addition to these sets, the manufacturer has also announced four other sets of internal threading tools designed for single point chasing of threads of smaller diameters. Set L-TH-8-5 contains five Style C standard length threading tools (Nos. 00000 to 0) for a minimum minor diameter of thread 5/64 to 9/32 inch. Set L-TH-S-4 contains four Style C standard length threading tools (Nos. 0, 1, 2 and 3) for a minimum minor diameter of thread of 9/32 to ⅝ inch. Set L-TH-EL-5 contains five Style C extra long threading tools (Nos. 00000 to 0). Set L-TH-EL-4 contains four Style C extra long threading tools (Nos. 0, 1, 2 and 3).

Vise Holds Milling Cutters Firmly While Blades are Reset

Product of The Ingersoll Milling Machine Co., 2414 Douglas St., Rockford, Ill., the Ingersoll Cutter Vise shown herewith is designed to hold inserted-blade milling cutters firmly in a convenient position while blades are being reset. With the cutter rigidly clamped, wedges can be driven and screws tightened more rapidly.



Ingersoll Cutter Vise in use

The power-operated jaws of the vise are opened and closed by an air-pressure valve as the operator indexes the cutter. A pointer mounted on the vise is used in setting the blades to the same height. Arbors for cutters with 1½ and 2½-inch diameter bores are standard equipment; arbors for other bore diameters are available as special equipment.

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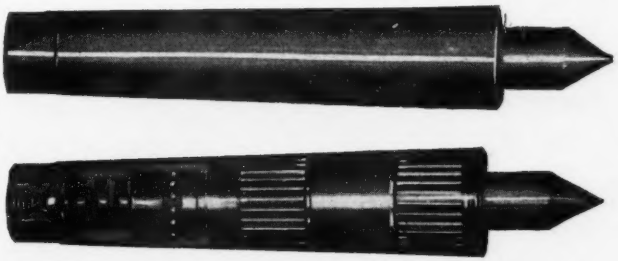
THE ORIGINAL CONCENTRIC LIVE CENTER



FASTER SPEEDS

AUTOMATIC THRUST ADJUSTMENT

Patented

Operates 4 - 5 times faster than ordinary live centers.
Less overhang...means more rigidity, more working range.
Spring loaded spindle gives automatic tail stock adjustment.

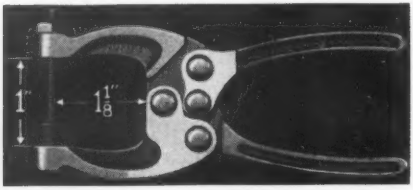
WRITE TODAY FOR COMPLETE INFORMATION!

CONCENTRIC TOOL CORP.

2970 Huntington Drive
San Marino, California

Plier-Type Toggle Clamp Suitable for Assembly, Sheet Metal, and Body Work

Designated as the "De-Sta-Co" No. 424, a portable plier-type toggle clamp announced by Detroit Stamping Co., 349 Midland Ave., Detroit 3, Mich., is said to be particularly suitable for aircraft assembly, sheet metal, and body work and for holding metal, wood, or plastic parts during machining, welding, and cementing operations. Its light weight (5 oz.) is claimed to make the clamp ideal for one-hand use, while its 4½-inch overall length allows for use of the tool in a restricted working area. The handles and jaws of the clamp are made of forged high alloy steel, while the bearing pins consist of a long-wearing stainless steel material.



"De-Sta-Co" No. 424 Plier-Type Toggle Clamp

Diamond Compound Designed for Sizing and Polishing Carbide Dies

Industrial Products Division, Elgin National Watch Co., Elgin, Ill., has announced the availability of a diamond abrasive compound prepared especially for sizing and polishing carbide wire drawing and heading dies. Designated as "Dymo-C," the compound is said to cut unusually fast when applied to carbide and is furnished ready for use, no mixing being required.

Other specific advantages claimed for the compound in sizing and polishing carbide wire drawing, extrusion, and heading dies include proper viscosity for convenient application, resistance to slinging, and an inherent property of working down the lapping stick or pin to the actual work area. In addition, the compound is said to feature resistance to

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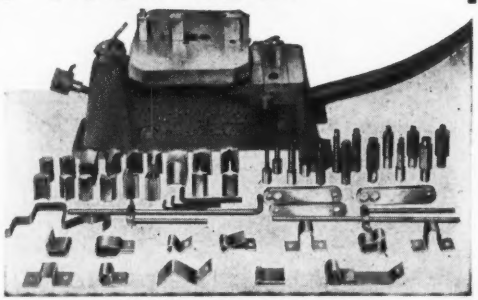
Bends — Cuts — Punches — Flats — Rounds Into Any Shape — Clamps — Brackets — Springs — Busbars — Wire Forms — Aircraft Work — Steel Rule Dies, Etc.



AIR OR HAND MODELS FOR UP TO 1/4" x 4" MATERIAL.

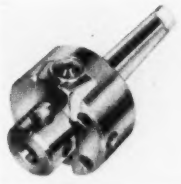
J. A. RICHARDS CO.

DEPT. 6M KALAMAZOO, MICHIGAN

drying out, deterioration or settling and uniformly precise grading of diamond particles.

Boring Heads Accommodate Tools Vertically or Horizontally

Identified as the 40 Series, five offset boring heads bearing the model numbers 43, 45, 47, 48, and 49 have been added to its boring head line by Flynn Mfg. Co., 133 Flowerdale Ave., Detroit 20, Mich. The smallest (Model 43) head has a 2¾-inch diameter and ½-inch bar capacity and weighs 3 lb. The largest (Model 49) head has a 6½-inch diameter and



Flynn 40 Series Offset Boring Head

1½-inch bar capacity and weighs 24 lb. The bar offset of the new series ranges from ⅝ to 1½ inches.

Each head features a smooth, round contour and precision micrometer offset adjustment and is machined from solid stock and ground after hardening. The tool block has an extension nose which is rounded to provide maximum safety for operators. In all five models, the boring tool may be readily inserted in the head either vertically or horizontally, it is claimed.

Improved Tool Control for Countersinking Machine

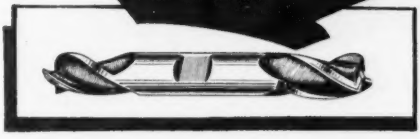
The latest model countersinking and deburring machine manufactured by Black Drill Co., 1400 E. 222nd St., Cleveland 17, Ohio, is now equipped with a positive-type tool actuating mechanism which permits precision operation on a wide variety of work up to the full 20-inch capacity of the machine. The control is a double rack and pinion traversing mechanism operated by a foot treadle. Each rack carries an arm fitted with a micrometer adjusting stud which trans-

ARROW TOOL & REAMER CO., ESTABLISHED 1916

A COMPLETE LINE OF "Fascut"

END MILLS ...

Including THE POPULAR 3 FLUTE!



The recognized advantages of the three fluted end mills have made this tool one of the leaders in the complete line of Arrow "Fascut" End Mills.

All Arrow End Mills are precision made tools for precision and production work. Over 34 years of experience in the manufacture of types of rotary cutting tools assures users of Arrow products both quality and economy.

ARROW also manufactures a complete line of STANDARD REAMERS • CARBIDES • SPECIAL TOOLS

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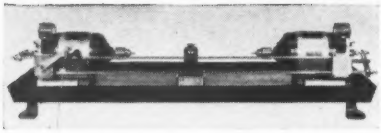


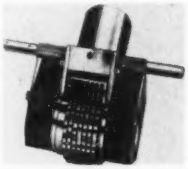
Black Countersinking and Deburring Machine with improved tool control

mits pressure to the motor shafts. These arms are quickly adjustable by set screws to any rack position, while an adjustable stop on the lower rack limits the travel of both motor shafts.

The machine can be used for production jobs involving countersinking, chamfering, deburring, and drilling operations.

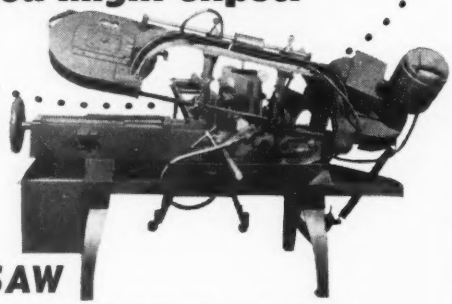
Head Designed for Numbering Any Material

The Parker Stamp Works, Inc., Franklin Ave., Hartford, Conn., has announced an automatic numbering head for punch press stamping. The head is available in standard sizes for numbering from 1 to 9,999,999,999 in sharp face Gothic characters or any material, including steel, or in flat face Gothic or shaded Roman on brass and other soft metals. According to the manufacturer, the head assures sharp, accurate stamping of consecutive or repeat numbers and allows for the addition of a duplicating attachment if required. On the larger sizes of the head, a machine setting can be easily determined at a glance from engraved numbers conveniently provided on the front of the lettering wheels of the head.



Parker Automatic Numbering Head

Get the advantages of AUTOMATIC BAR STOCK CUT-OFF at a fraction of the cost you might expect



with a WELLS SAW and WELLS-O-BAR Feed Master

A set-up for automatic repetitive cutting need not be prohibitively expensive. By combining a Wells Metal Cutting Band Saw and a Wells-O-Bar Feed Master you can automatically cut any quantity of identical lengths of bar stock with a modest investment. See your Wells Dealer for complete information or write direct.

Wellsaws

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION

808 TYLER ST. - THREE RIVERS, MICH.

Production Miller Is Engineered to Maintain Accuracy

Nolan Corp., Rome, N. Y., has announced a production milling machine, known as the SuperMill, which is available in bench and floor models and is of sturdy construction and engineered to maintain its accuracy under severest use. Designed for easy operation by unskilled workers, the machine is arranged to accommodate motors up to 2 h.p. and is provided with a hand lever feed as standard equipment, with screw feed and automatic feeds available on order. The spindle of the machine is mounted on precision ball bearings and is designed to accommodate No. 40 American Standard arbors.

Nolan Bench Model SuperMill

Table specifications of the machine are as follows: size overall, 6 x 20 inches; working surface, 4 x 16 inches; longitudinal feed with hand lever, 12 inches; longitudinal feed with screw, 12 inches; longitudinal feed with automatic feed, 8 inches; and T-slot, ½ inch. Head specifications are: vertical range, 5 inches; diameter of cutter accommodated, 4 inches; overarm diameter, 2 inches; and lateral adjustment of quill, 2 inches. The machine is furnished complete with one set of single groove pulleys for any standard ratio from 1:1 to 1:6. A special intermediate drive for lower speeds or multi-step cone pulleys are available as extra equipment.

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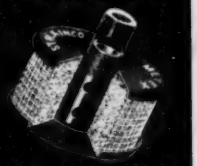

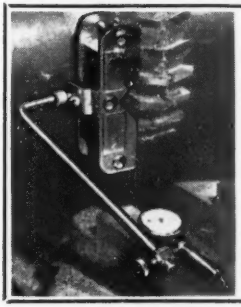

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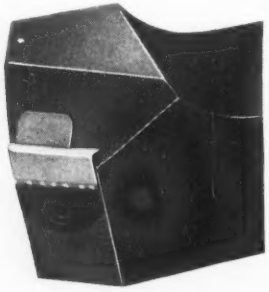
Turning Tool Incorporates Features to Conserve Carbide and Control Chips

The Viking Tool Co., Shelton, Conn., has announced an improved turning tool combining several unique features to conserve critical carbide and to control the chip. The tool bit in this inserted carbide turning tool continues to possess a very heavy cross section to withstand heavy cuts. To conserve this highy critical cutting material and to prevent any possibility of tip movement under the pressures of heavy cuts, a thin layer of serrated steel has been added to the bottom of the tip and an extension has been added to the rear of the tip.



Viking Improved Turning Tool

A new independently adjustable inserted carbide chip breaker for the control of the chip in steel turning operations has also been added. The toolholder has been redesigned to accommodate a block of solid carbide on top of the tool tip, providing carbide-to-carbide contact, with the tip and chip control block locked firmly in the toolholder simultaneously. The relation of the inclined surface of the chip breaker to the cutting edge of the tool tip is independently controlled by an adjusting screw at the rear of the chip breaker. Thus, the chip can be controlled on the job to meet varying conditions of feeds, speeds, depths of cuts, and material machined.

The broached type holder providing large areas of contact of steel adjacent to the carbide tip is said to prevent localizing of excessive heat at the cutting edge. Heat is conducted to the steel toolholder and quickly dissipated, so that fractures of carbide resulting from excessive localized heat at the cutting edge are thus reduced to a minimum.

The improved turning tool is manufactured in two size ranges for medium and heavy duty turning. Shank sizes range from ¾ to 2 inches. Straight turning, 20-degree lead angle, offset, and facing styles are offered in each size range. Carbide tips are available in three steel cutting grades and two cast iron, non-ferrous grades.

Electric Hoist Ideal for Hook Suspension

Wright Hoist Division, American Chain & Cable Co., Inc., Bridgeport 2, Conn., has announced the addition of a wire rope electric hoist identified as the "Frame B" to its line of "Speedway" hoisting equipment. Said to be ideal for hook suspension, the hoist is available in capacities from 250 to 1,000 lb. and utilizes two parts of $\frac{5}{16}$-inch Trulay cable, a small load hook, and a small trolley. The construction also includes shaved gears and a lower limit switch as standard equipment.

Wright "Frame B Speedway" Electric Hoist

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

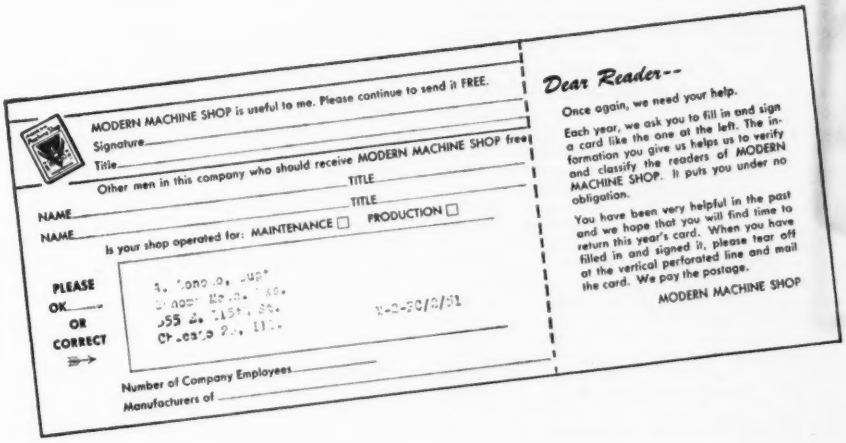
An Important Message to All Readers of Modern Machine Shop

IF you have been on our mailing list for some time, you undoubtedly will recall that you have received a questionnaire type of card similar to the one reproduced below. The information that you have given us on these cards in the past has not only provided us with a means for keeping our mailing lists up-to-date but also has enabled us to comply with certain rules and regulations set forth by Controlled Circulation Audit, Incorporated, an organization in which we as publishers of Modern Machine Shop hold a membership.

Our circulation files are carefully examined at regular intervals by an auditor from CCA, one of the purposes of such an audit being to determine whether or not Modern Machine Shop is being sent to qualified personnel in the metalworking field. Briefly, a qualified person is a plant executive whose position places upon him a measure of responsibility for the selection of tools and equipment used in the plant.

Recently, the Board of Directors of CCA adopted several new and amended rules with which we must now comply. One of these rules—defined as Reader Eligibility—applies directly to you the reader. In order for us to continue to send copies of Modern Machine Shop to you, we must have the information requested on the questionnaire cards sent to you.

During the next week or so you will receive a questionnaire card as shown below. **Please fill out this card and return it to us without delay.** This will enable us to keep you on our mailing list.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You have been very helpful in the past and we hope that you will find time to return this year's card. When you have filled in and signed it, please tear off at the vertical perforated line and mail the card. We pay the postage.

MODERN MACHINE SHOP

New Shop Literature

Pedestal Micrometers and Pedestal Indicators designed to provide convenient, practical units for saving time and improving workmanship in a wide variety of layout, machining, and inspection operations are fully illustrated and described in a four-page folder issued by Bartelt Engineering Co., 1216 Partridge Ave., Beloit, Wis. The various models in which the micrometers and indicators are available are covered, including prices of same.

Plastic Caps for Alemite Fittings. Bulletin P-5103 issued by The S. S. White Dental Mfg. Co., Plastics Division, Dept. 5, 10 E. 40th St., New York 16, N. Y., contains complete details, including sizes and prices, on flexible plastic caps for ⅛-inch dot, button head, and zerk or hydraulic fittings. The bulletin illustrates how these black vinylite caps can be easily slipped on or off fittings and used over and over again.

Sheet Metal Products. A four-page two-color catalog now being offered by Platt & Labonia Mfg. Co., 70 Broadway, North Haven, Conn., illustrates and describes a line of sheet metal fabricated products in brass, steel, stainless, Monel, and aluminum, including shop boxes, shop trucks, tote pans, and special production racks.

Cutting Tools and Holders. The Weldon Tool Co., 3000 Woodhill Rd., Cleveland 4, Ohio, has published a 95-page cloth-bound catalog (No. 10) listing all stock tools of its manufacture. Tools covered in the catalog include a variety of end mills, including double-end and single-end end mills of various designs; cutoff blades; T-slot cutters; counterbores; end mill sharpening fixtures; tap sharpening fixtures; circular form tool sharpening and measuring fixtures; measuring attachments for lathes; stub arbors; single and double-end end mill holders; adapters, and so on. The catalog also contains a section illustrating many examples of special tools which the company is equipped to produce; also, helpful tables and charts, as well as a pocket on the inside front cover containing a price list of the tools covered in the catalog.

Carbide Drill Supplement. Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich., has compiled a drill supplement (No. 4) to its regular Catalog No. 50. This supplement illustrates and provides complete price and dimensional data on solid carbide drills and carbide-tipped drills in a variety of spirals. Also included is information on "Super Hard" Drills for hardened steel and core drills. The booklet brings together all essential drill information along with instructions on set-up, feeds and speeds, lubricants, and regrinding.

Contour Grinding with Continuous Inspection. The Cleveland Grinding Machine Co., 6514 St. Clair Ave., Cleveland 3, Ohio, now has available a four-page two-color bulletin which illustrates and describes in detail its "Visual-Grind" Machine which is said to meet the demand for accurate surface form grinding in both large and small toolroom operation. Typical examples of workpieces produced on the machine are shown, and complete specifications regarding the unit are listed.

Safety Valve. A four-page two-color bulletin (No. 304) now available from Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich., illustrates and describes a safety valve for industrial press and similar applications. Included in the bulletin is a cross-sectional view of the valve, as well as complete installation data.

Marking Devices. A unique "job-indexed" catalog of marking devices designed to simplify the selection of such devices has been published by New Method Steel Stamps, Inc., 149 Joseph Campau St., Detroit 7, Mich. All standard holders for performing each particular class of work on machines or manually are illustrated and described alongside of each other. For annular marking, for instance, three basic types of holders are shown in a group—a holder with interchangeable-diameter pilots and using interchangeable type, a pilot holder designed for use with characters on solid removable bushings, and a holder which permits selective marking without changing type or retainer. Standard holders for other applications, typical custom markers, automatic roll markers for use on screw machines, embossing dies, logotypes, roll dies, and so on, are similarly grouped. Variations in hand stamps are also handled in this manner.

Vertical Die and Surface Grinder which is said to be capable of producing finishes of 2 micro-inches or better on carbide dies is described and illustrated in a four-page circular (No. 529-1) issued by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn. Specifications of the two sizes in which the machine is available are included.

Punch Presses. A four-page two-color catalog issued by L & J Press Corp., 826 Ren St., Elkhart, Ind., describes and illustrates a line of open back inclinable punch presses comprising 12 models ranging in size from 6 to 80-ton capacity, with the four larger sizes also available in back geared types. Complete specifications are presented for every model, as well as fully dimensioned diagrams of the lower rams.

Revised J.I.C. Hydraulic Standards. Revised to incorporate all changes and additions made at the most recent meeting of the Joint Industry Conference on Hydraulics, a new edition of the J.I.C. Hydraulic Standards for Industrial Equipment is now being offered to engineers, designers, hydraulic equipment users and manufacturers by Miller Motor Co., Dept. M, 4027 N. Kedzie Ave., Chicago 18, Ill. The revised "Standards" are reproduced word for word in an 8½ x 11-inch 16-page booklet conveniently hole punched for insertion in a binder or notebook. Along with the "Standards" are presented a sample circuit, glossary of terms, two pages of standard symbols, important information on the various types of piston and rod seals available for different applications, and an interesting point-by-point comparison with cutaway illustrations showing how Miller Hydraulic Cylinders meet the revised J. I.C. Hydraulic Standards specifically relating to cylinders and their component parts.

Engine, Toolroom, and Gap Bed Lathes. A fully-illustrated 24-page catalog (No. T-101) on light duty "Tray-Top" Lathes, including engine, toolroom, and gap bed models, has been published by Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio. Unusually detailed in content, the catalog contains complete specifications, descriptions of design and construction features, and tables of available threads and feeds. The catalog also presents the full line of Tray-Top Lathe accessories and condensed data on Cincinnati Standard Lathes and Canady-Otto-Cincinnati Drilling Machines.

Metal Cutting Tools. A 176-page catalog (No. 50) containing illustrated, descriptive, and tabular information, including dimensions and prices, on a complete line of high speed metal cutting tools has been published by Reltool Corp., 4540 W. Burnham St., Milwaukee 14, Wis. Covered are various types of reamers, arbors, bits, centers, knives, collars, saws, counterbores, countersinks, end mills, cutoff blades, diesinking cutters, dovetail cutters, from relieved cutters, form tools, gear cutters, mandrels, profiling cutters, shears, spacers, step drills, spotfacers, taps, special tools, and other products.

Floating Disc Clutches. The Carlyle Johnson Machine Co., Manchester, Conn., is now offering a case history book showing installations of its "Maxitorq" Floating Disc Clutches in such equipment as a can seaming machine, packaging equipment, power sweeper, industrial truck, machine tools, and other machinery. The book is fully illustrated and includes complete information on the Maxitorq Clutch, as well as the new Maxitorq Automatic Overload Release Clutch, especially designed for the protection of high speed machinery such as packaging, labeling and wrapping machines.

"Mounting Technique for Wheel Sleeves on Cylindrical Grinding Machines" is the title of a 12-page 5 x 7-inch booklet published by Grinding Wheel Institute, Greendale, Mass. The booklet discusses the proper mounting technique for grinding wheels on sleeve type mounts and contains recommendations covering the amount of torque or "wrench pull" to use when mounting grinding wheels on several makes on cylindrical grinding machines.

Lathes and Shapers. Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill., is now distributing a 16-page catalog presenting complete information on its line of lathes, shapers, and accessories. Covered are 11-inch quick change lathes on pedestal bases; 11-inch bench, floor and cabinet lathes; 11-inch quick change gear turret lathes; 10-inch back geared screw cutting lathes; 10-inch quick change gear lathes; 10-inch cabinet type screw cutting lathes; 10-inch hand screw machines; 10-inch quick change gear turret lathes; 10-inch cabinet type turret lathes; 10-inch manufacturing turret lathes; and various accessories for the 10 and 11-inch lathes. Also covered is the Logan 8-Inch Shaper and accessories for same.

AMERICAN GEAR MANUFACTURERS ASSOCIATION

ELECTS NEW OFFICERS AND DIRECTORS

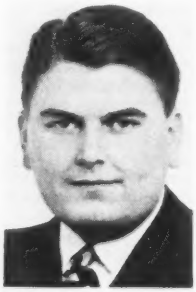
George H. McBride

S. L. Crawshaw

Louis B. Bond

DURING the 35th Annual Meeting of the American Gear Manufacturers Association which was held at The Homestead, Hot Springs, Virginia, June 4-5-6, new officers were elected for one year terms and four new directors were elected to serve until June 30, 1954. These new officers and directors are as follows: George H. McBride, Manager of the Gearing Division, Westinghouse Electric Corporation, Pittsburgh, was elected President; S. L. Crawshaw, Assistant to the President, Western Gear Works, Seattle, Washington, was elected Vice President; Louis B. Bond, Vice President and General Manager of the Christiana Machine Company, a subsidiary of the Charles Bond Company of Philadelphia, was re-elected Treasurer; Charles R. Kessler, President of the Beaver Gear Works, Inc., Rockford, Illinois, was elected to the Executive Committee as were Marvin R. Anderson, Executive Vice President of the Michigan Tool Company, Detroit, Michigan; R. B. Holmes, General Manager, Philadelphia Works of the Link-Belt Company; and Gunnar E. Gunderson, President of the Brad-Foote Gear Works, Incorporated of Cicero, Illinois.

Charles R. Kessler



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No. By Gage	Length Inches	Our Price Net Each
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11 to 20	5 3/4	.90
21 to 30	5 3/8	.80
31 to 40	5 1/4	.70
41 to 50	4 1/2	.60
51 to 60	3 1/2	.50

Straight Shank

Size Inches	Length Overall Inches	Length Flute Inches	Price Each Net
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9/64	12	9	1.65
5/32	12	9	1.65
11/64	12	9	1.65
3/16	12	9	1.65
13/64	12	9	1.76
7/32	12	9	1.76
15/64	12	9	1.95
1/4	12	9	1.95
17/64	12	9	2.05
9/32	12	9	2.05
19/64	12	9	2.25
5/16	12	9	2.25
21/64	12	9	2.50
11/32	12	9	2.50
23/64	12	9	2.75
3/8	12	9	2.75
25/64	12	9	3.05
13/32	12	9	$3.05
27/64	12	9	3.30
7/16	12	9	3.30
29/64	12	9	3.60
15/32	12	9	3.60
31/64	12	9	3.60
1/2	12	9	3.60

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17/32	15	12	$7.15
9/16	15	12	7.70
19/32	15	12	8.25
5/8	15	12	8.80
21/32	15	12	9.00
11/16	15	12	9.10
23/32	15	12	9.35
3/4	15	12	9.50
25/32	15	12	10.50
13/16	15	12	12.00
27/32	15	12	12.65
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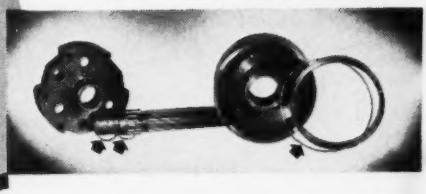
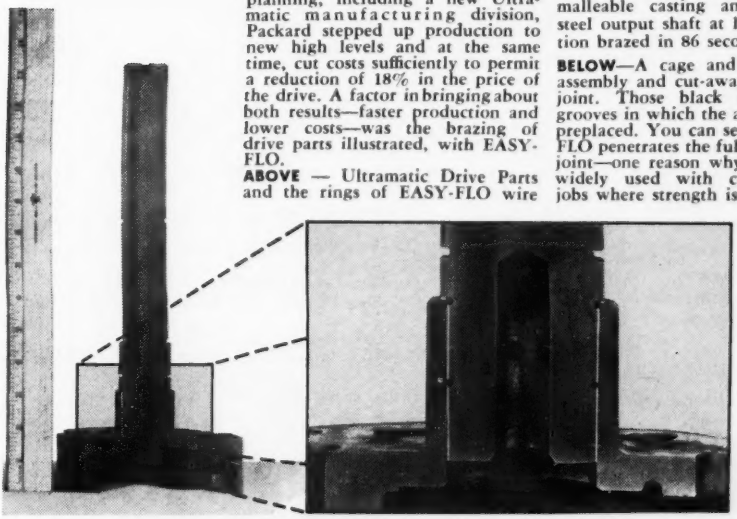
EASY-FLO helped Packard boost Ultramatic Drive production—and cut costs...



• When Packard brought out the Ultramatic Drive, the demand quickly outstripped production. Through smart mass production planning, including a new Ultramatic manufacturing division, Packard stepped up production to new high levels and at the same time, cut costs sufficiently to permit a reduction of 18% in the price of the drive. A factor in bringing about both results—faster production and lower costs—was the brazing of drive parts illustrated, with EASY-FLO.

ABOVE — Ultramatic Drive Parts and the rings of EASY-FLO wire (arrows) used to join them. Clutch housing and cylinder sleeve at right of picture are induction brazed in 87 seconds. Planetary cage pearlitic malleable casting and SAE 1151 steel output shaft at left are induction brazed in 86 seconds.

BELOW—A cage and output shaft assembly and cut-away view of the joint. Those black dots are the grooves in which the alloy rings are preplaced. You can see how EASY-FLO penetrates the full depth of the joint—one reason why this alloy is widely used with confidence on jobs where strength is a "must."



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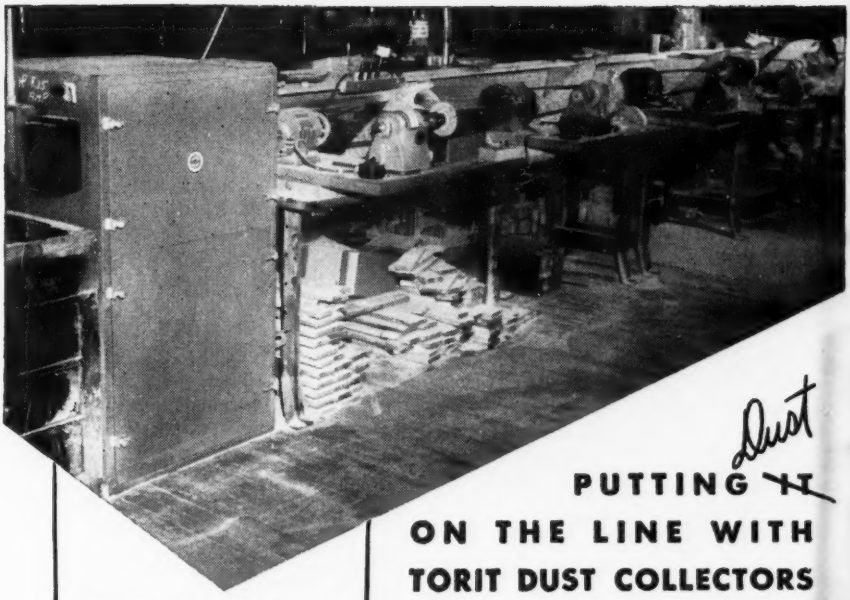


PUTTING ~~IT~~ Dust

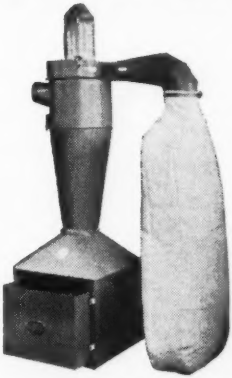
ON THE LINE WITH TORIT DUST COLLECTORS

In this line up there are six small wheels and disks, all connected to one Model 84 Torit Dust Collector. These are being used to finish small wooden parts, but the set up is equally applicable to metal, plastics, or other materials.

This installation well illustrates the adaptability of Torit Dust Collectors to production line operations. Pipes, collecting hoods, and even the dust collector are located so they do not cut off light or interfere with the work. Efficiency, too, is high.

There is a Torit Dust Collector for your dust collecting job. You'll find it economical to install and exceptionally low in operating and maintenance costs. For details, and latest Torit catalog, write:

TORIT FB Type Dust Separator



Torit also manufactures a line of cyclone type dust separators. These can be ordered with an after-filter, as shown above, which permits recirculating the cleaned air within the plant.

TORIT

Manufacturing Co.

296 Walnut Street St. Paul 2, Minn.

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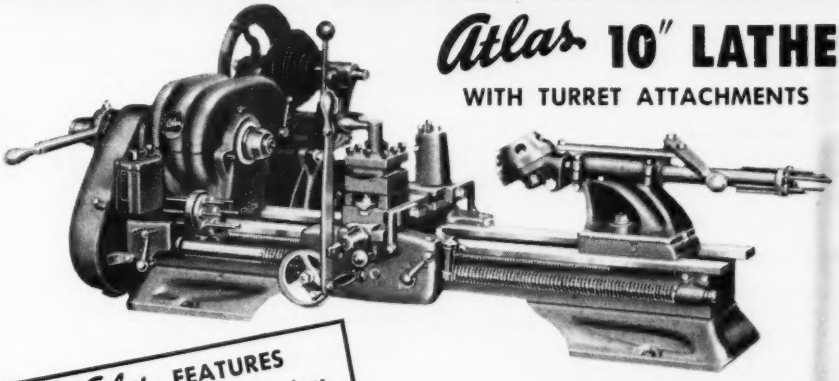
FOR HIGH PRODUCTION OF SMALL PARTS - *At Lowest Cost!*



Atlas 10" LATHE
WITH TURRET ATTACHMENTS

Atlas FEATURES

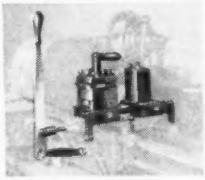
- ★ Timken tapered roller bearings.
- ★ 16 spindle speeds — 28 to 2072 RPM. Wide thread cutting range.
- ★ Precision ground bed. Rugged, accurate construction.
- ★ Power cross and longitudinal feeds standard equipment.

Giving you up to 11 different operations, in the sequence you want, this Atlas lathe with turret attachments can be a real help right now on small parts production.

Tailstock turret has six ¾" holes for tool holders and six depth stop screws. Feed lever automatically locks and unlocks turret head. Carriage turret provides five more operations. Spindle has $^{25}/_{32}$" bore, ½" collet capacity through spindle.

With the Atlas, for a few hundred dollars instead of thousands, you can equip for test DO runs or swing immediately into round-the-clock precision production. Send for latest catalog with complete specifications and construction features.

LEVER-TYPE CARRIAGE TURRET



This assembly replaces the standard screw feed for faster operations on forming, roughing, finishing, chamfering, and cutting off. The four-way tool post turret is released by convenient lock handle and rotated to any one of four operating positions, automatically indexed. The back-slide tool post permits a fifth operation.

Tool posts take ⅝" cutter bits. Adjustable stops at front and back of double tool cross slide are set to indicate cutting depths. A "multi-stop" is also available to accurately gauge length of each cut.

Atlas 10" lathes and accessories are precision built in every respect for close tolerance work.

ATLAS PRESS CO.

40TH YEAR *Atlas*

746 N. Pitcher St.
Kalamazoo, Michigan

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TOOLING UP FOR ORDNANCE WORK?

• Investigate the tool holder developed to utilize the full inherent capabilities of carbide.

VIKING V-BACK TURNING TOOLS

V-BACK TOOL BITS

Serrations on bottom of tip and corresponding serrations on locking wedge combined with broached holder, provides positive tip anchorage under all types of cuts. V-Back method of tool bit design provides equivalent tool life and performance of large tip with considerably smaller tip.

Quick removal and replacement of dull tool bits without removal of tool holder.

Economical reconditioning of dull tool bits. Tips are ground only on the wear surfaces. Heavy dull lands are removed with minimum waste of carbide.

ON THE JOB ADJUSTABLE CHIP BREAKER

"On the job" adjustment of chip breaker to control the chip to meet variations in speeds, feeds, depth of cuts, and material machined.

Carbide to carbide contact of chip breaker block and tool bit allows no wedging of chip under breaker to fracture the carbide.

Chip breaker block and tool tip simultaneously locked in tool holder with one locking device.

Solid carbide block provides trouble free, long life chip breaker. No chip breaker grooves to grind into the tip each time tool is sharpened.

Holders supplied in shank sizes from ¾" to 2."
Straight turning, 20 degree lead angle, offset and facing tools.

VIKING TOOL COMPANY SHELTON, CONN

There's One in Every Shop — *By Wesser*

"FERDINAND"
Boy! IF THAT OVERHEAD CRANE OPERATOR EVER MISSES, AND SPOILS HIS FLOWER GARDEN, IT WILL BE A MANSLAUGHTER CASE FOR SURE!
IF FERD HAD ONLY LEARNED TO READ, HE MIGHTA BEEN A GREAT HORTERCULTURIST LIKE BURBANK, LIKE AS NOT!
HE'S A BIG, ROUGH GORILLA IN A BAR-ROOM FIGHT, BUT A MEEK LAMB AMONG THE POSIES!
KEEP OUT!
Burt Wesser

GET YOUR COPY NOW!

—of "Standard's" UNBRAKO Standards.
Write on your business letterhead, today.

"STANDARD" Recommends *STANDARDS*

SOCKET UNBRAKO® SCREWS

Knurled head socket cap screws
Flat head socket cap screws
Self-Locking socket set screws

Knurled head stripper bolts
Precision-Ground dowel pins
Fully-Formed pressure plugs

SPS STANDARD PRESSED STEEL CO.
JENKINTOWN 22, PENNSYLVANIA

Over The Editor's Desk

Advertising and the American Economy

PERIODICALLY, in their search for additional funds to finance the administration's various programs, some Congressmen will raise the question as to whether a tax can be laid on advertising, or of limiting, for income tax purposes, advertising expenditures. The people who are engaged in the business of publishing or advertising are thoroughly familiar with the function of advertising in the American economy, but others may not be so well acquainted with the facts. Perhaps our readers would like to know something about it.

Advertising is sometimes assailed as "waste"—as an extra cost that must be passed on to the buyers. These critics fail to point out that, while advertising represents a large sum, it is only 1.9 per cent of our national income and probably less than 2 per cent of our gross sales volume. They overlook the fact that the cost of merchandise, plus the advertising cost, is far less than it would be if there were no advertising—that selling costs would be much higher if there were no way of telling the world at large where goods and services could be found.

Advertising more than pays its own way; it multiplies sales and thus, by reducing overhead costs and making possible mass production, contributes to lower prices. The advertising expenditure per unit of sale on most products is small indeed; one-third of a cent on a pack of cigarettes; one-fiftieth of a cent on a well-known soft drink; one-third of a cent per dozen oranges; one-fourth of a cent on a can of soup. The percentage is about the same on most merchandise.

A new product is a museum piece until it is purchased and used by the consumer—and history tells how long it took to get new products and conveniences accepted by the public before advertising became general. Elias Howe worked many years to get the first sewing machine accepted, and Samuel Morse had practically as much difficulty trying to get the public to believe in the telegraph. McCormick preached the gospel of mechanical harvesting for 14 years before he sold 100 reapers.

Today the story of a new product or service is told to millions of people within a few days or weeks and as sales gather momentum and multiply, manufacturing costs and prices go down. In 1922 the average oil burner for a home cost $1,000; by 1937 the price had dropped to one-third as much. In 1925 the average electric refrigerator cost $425; by 1936 the price had fallen to $164. Automobile tires once sold as high as $100; today much better tires can be had for one-fifth of that amount. Today, even though costs have doubled and tripled, a better automobile can be purchased for any given amount than could be bought for the same number of dollars 30 years ago.

These better products and lower prices have been made possible by widespread distribution, made possible largely through advertising. Advertising helps the consumer to find the merchandise he needs, and helps the manufacturer to find the

people who need his merchandise. Furthermore, it helps to defray the costs of his newspapers and periodicals, and provides entertainment via radio and television programs.

It costs many times as much to publish a newspaper or popular magazine as the reader pays for it; the advertising pays the difference. The advertisers who present the stories of their machines and tools in the pages of MODERN MACHINE SHOP pay *ALL* of the costs, making it possible for the plant executive to receive this magazine without any charge whatever. Without the benefits of advertising, the prices that publishers would be forced to charge for their publications would be prohibitive today.

In no other country do we find information on all subjects so readily available to the people. Staff editors of technical journals such as MODERN MACHINE SHOP travel many thousands of miles per year, inspecting new plants and observing new methods to be described and illustrated for the benefit of their readers.

As an example of costs of publishing a technical magazine; the cost of paper, engravings, and wages to printers amount to several hundred thousands of dollars per year. Office salaries, overhead, postage, and traveling expenses amount to several hundred thousand more. And all of this is paid by the advertisers. Yet the cost to the advertiser, proportioned according to sales, is much less than it would be if he had to depend upon "word-of-mouth" advertising to spread the news of his product.

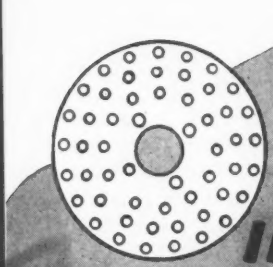
In World War II America armed its own and Allied forces with planes, guns, tanks, and other fighting materials, and did it without too much delay. What took Hitler a decade to build, even with Germany's genius, we did in one-fifth of the time. We were able to do it because we had the manufacturing plants; all we had to do was to convert them from the making of automobiles, radios, and other products to the making of war materiel.

We had the plants because the American people can and do buy the products that those plants were built to produce—and buy enough of them to make these great manufacturing plants possible. The people can buy because the products are priced within their reach, and the low prices are made possible by our huge production. Thus, again, advertising played a part in the country's defense.

Furthermore, advertising rendered important assistance to the Government in informing the people about matters concerning the war effort. Advertisers estimate that the commercial value of advertising space, time, and services voluntarily contributed for war services in 1942 exceeded $250,000,000. Substantially more was contributed in 1943 and subsequent years.

Today, with all the uncertainties before us, advertising is moving with the times. It rendered its great services throughout the war free from obstructive legislation or taxation, and stands ready today to render still greater service when such service is needed. Unhampered, it can go on contributing its share toward making and keeping America great.

Howard Campbell



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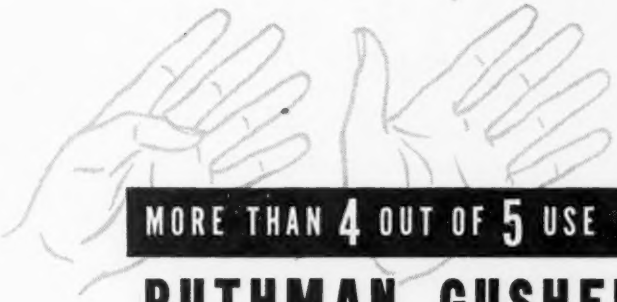
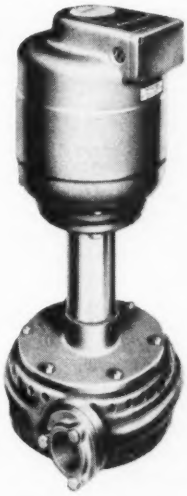


MORE THAN 4 OUT OF 5 USE

RUTHMAN GUSHER

Machine Tool Coolant Pumps



There's a good reason why four out of five of the leading manufacturers of metal-cutting equipment regularly supply Gusher Coolant Pumps on their machines. They know from experience that Gusher Pumps are more dependable and longer lasting.

Gusher Pumps are built by *Ruthman*, designers and originators of the vertical motorized machine tool coolant pump and their skill and experience is continually directed toward giving you a better, more advanced coolant pump. Follow the leaders—specify Gusher Coolant Pumps on your machines.

THE RUTHMAN MACHINERY CO.

1817 READING ROAD • CINCINNATI 2, OHIO

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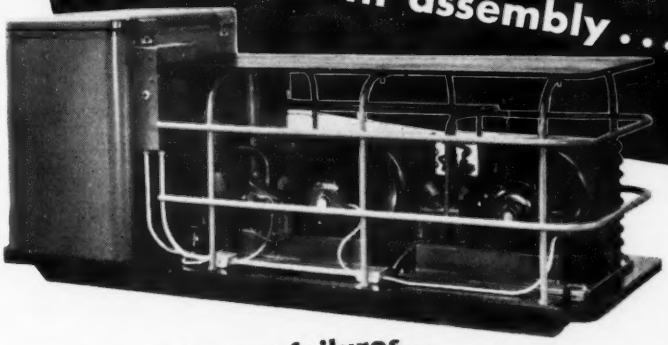
SUB-ZERO Chilling Saves $412.00 a day on shrink fit assembly...



eliminates equipment failures...

A midwest manufacturer of ink pigment grinders had difficulty with rollers. The rollers, of chilled cast iron, with a 12" O.D., had a hollow 6" core into which a hollow spindle was inserted. Rollers were heated to allow assembly with the spindle. This heat caused the rollers to crack during assembly in a high percentage of cases. Also spindles worked loose from the rollers in operation.

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Do your operations include shrink-fit assembly? Sub-Zero Chilling will reduce your costs, simplify your operations. Write for details.

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Phos. Bronze	.0032"
Alum. Bronze	.0032"
Brass	.0036"
Aluminum	.0043"
Magnesium	.0045"

Other diameters shrink proportionately

sub-ZERO products

MANUFACTURING DIVISION

Deepfreeze Distributing Corp.

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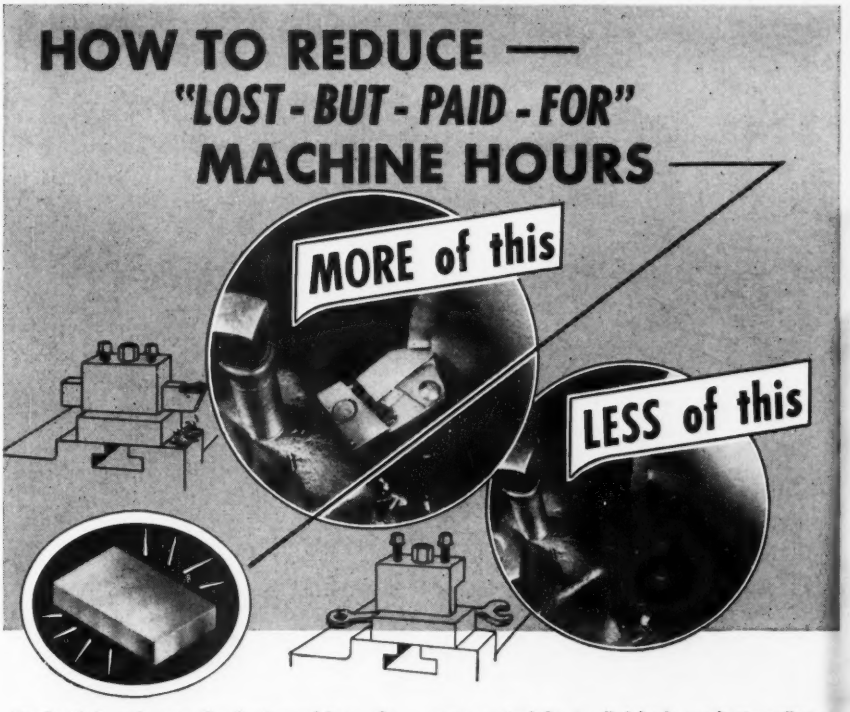
HOW TO REDUCE — "LOST-BUT-PAID-FOR" MACHINE HOURS



Productivity of even the best machines, designed for continuous service, can be, and often is, woefully curtailed by inferior tools that wear rapidly and require frequent shutdown for replacement. Production is thereby recurrently interrupted, *but* costs never cease. Lost time must be paid for.

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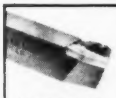
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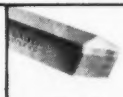
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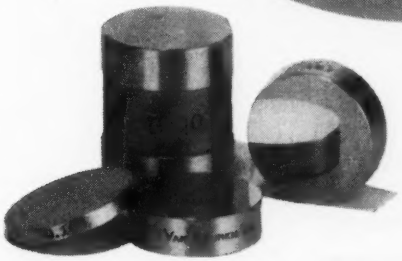

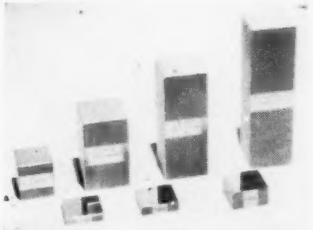

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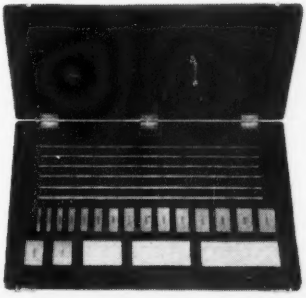

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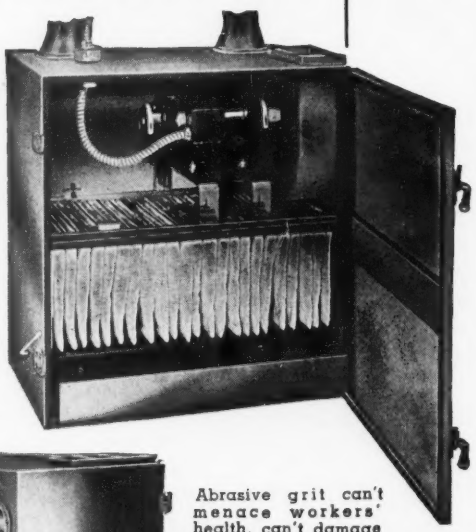

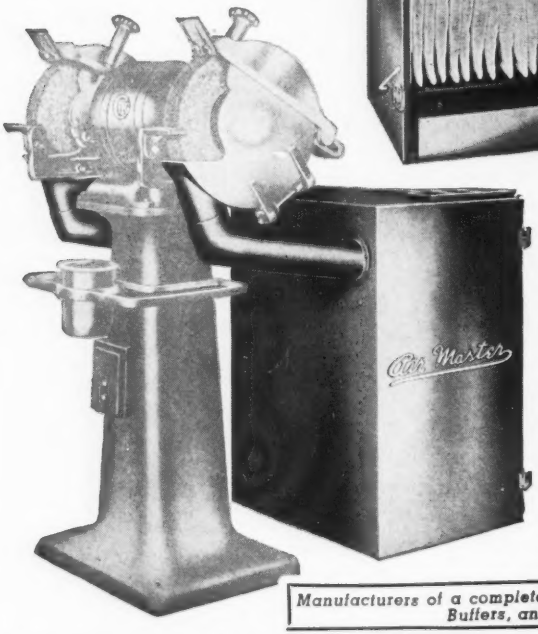

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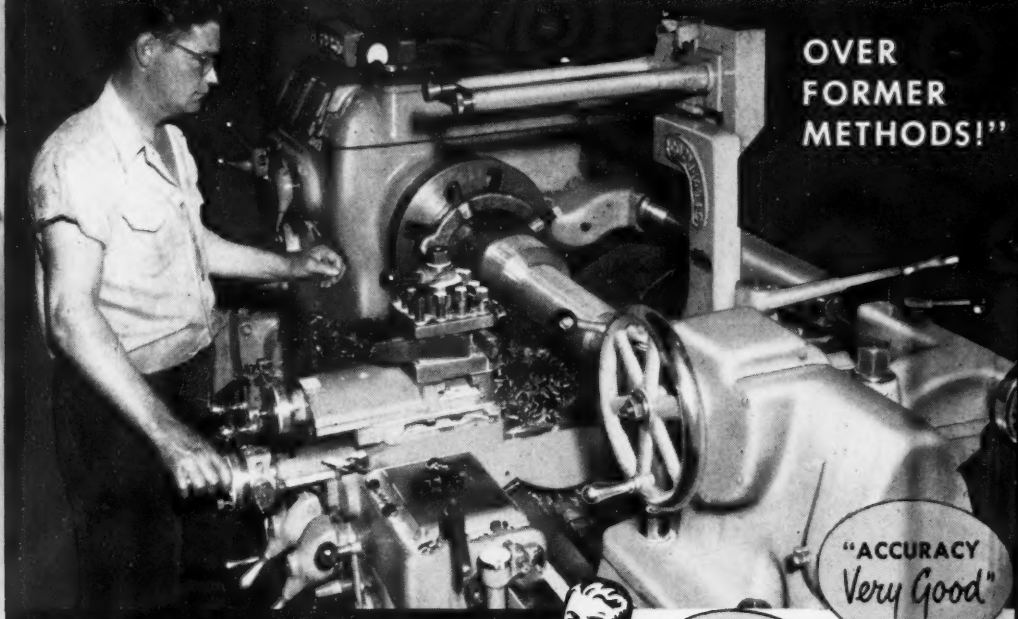

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